

Plenty



ALL

The Promise :

"No Wastemind, No Wasteland,
Anywhere on this Earth."

Prayog Pariwar Methodology

Prof. S. A. Dabholkar

PLENTY for ALL

PRAYOG PARIWAR METHODOLOGY

unto this last.

**Networking of Self-Experimenting Ventures
for Nature-friendly & Human-friendly
prosperity**

Prof. Shripad A. Dabholkar

Mehta Publishing House



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Development.

*Dedicated
to
the revered memory
of my Father
and to
My Mother
now happily in her 94th year.*

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" विश्वं पुष्टं ग्रामे अस्मिन् अनातुरम् "

Let All the Abundance and Fulfillment of the Universe
be in our Habitats. (ग्राम)

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PREFACE

" विश्वं पुष्टं ग्रामे अस्मिन् अनातुरम् "

Let All the Abundance and Fulfillment of the Universe be in our Habitats.(ग्राम)

The Rishis propounded a fundamental concept in this profound verse from the Rgveda. The message implies that we should discover the completeness and contentment of the Universe in our very own towns & villages. The economic revolution which can remove the Poverty of all Nations can be accomplished if all of us everywhere (in Metropolitan cities or in the smallest of villages) understand this home truth as we develop our habitats.

It is the local person who will bring about this revolution, and not any expert or investor from outside. The rich spiritual and cultural tradition of India was not created by any scholars or intellectuals from outside but by saints and sages from various rungs of the local community. India's aspiration for independence and political will was not nurtured by the noblemen and barons serving the ruling fiefdoms, but by the poor peasants and common people. Prayog Pariwar has proved that without depending on foreign aid or any imported technology, the foundation of India's allround economic development can be built by experimenting farmers and by the common individuals in their own neighbourhoods and various areas of their lives.

This book introduces some of these experiments. Several radical concepts are presented here. By the careful and scientific study of our neighbourhood resources, we can create plenty, to provide for all the needs of the world's entire population. This science of dialogue and network with all the resources in our neighbourhood is illustrated with various examples, which we feel will be valuable to any experimenters. In this country, blessed with abundant solar energy, the application of these principles can certainly bring Plenty for All.

This book seeks to provide answers to the problems perplexing the entire world for the past whole century, in removing the Poverty from the entire world. The minimum resource base for sustainable living as the basic human right of every family on this earth is already available. We have only to find out the ways of it's proper utilization. Prayog Pariwar's humble claim is that it has found out this way. This was brought to the notice of the United Nations, by our Pariwar, in the International Year of the Family 1994.

In this era where many doubt the contribution of an individual in transforming problems of global dimensions, the examples in this book show the successful results of lone crusades, without falling into the usual traps of joining, fighting or resigning to the present establishments.

This book relates how the perceptions and findings of a few people can become a thriving network of learning exchanges, tested in field conditions and has now evolved into a movement called 'Prayog Pariwar'. It is committed to helping an average human being in any remote corner of this world, to discover the true potential of his own capacities and the abundant potential which he can network from his neighbourhood and in the process become autonomous in fulfilling all his needs, by using the latest knowledge brought to him in a demystified manner.

There are two parts to the book. In the first part, through the author's life story and experimentation, his approach and methodology for creating self learning knowledge networks to resolve any problems in various life situations becomes evident. The presentation should be seen in this light.

In the second part, the vast potential of Prayog Pariwar Methodology and the Pedagogy of Self-learning Groups to bring dynamic change in any particular area of life and transformation in the society is shown in the specific context of Agriculture & Energy, worked out to address the basic problems of our world, like poverty, subsistence, environmental degradation and wastage of energy.

Those involved with Nature farming, Rural development, Alternative Energy, New Economics, Appropriate Technology, Neighbourhood Energy Networks etc. will find it immensely useful and stimulating.

However the P.P. methodology does not stop at that. It is too powerful a tool to be limited to just solving problems of survival and subsistence. It has the potential to uncover the hidden potential in each and every individual in any arena of life. From uncovering the deeper aspects of the human psyche to understanding human relationships, from creative capacity development to understanding complex scientific phenomenon, the P.P. approach of enabling spontaneous generation of learning exchanges has a lot to offer.

Even in this age of interactive electronic media, the book format is still very potent, portable and robust with a large user base and flexibility. While designing 'Plenty for All', we have tried to expand its use value by experimenting with a different format which is interactive. The margins are used for a dialogue where the reader can reflect, argue or enhance the content. A lot of visual material and supporting information has been provided in the form of appendices. We hope you find it useful.

Prayog Pariwar Network
August 1997

GLOSSARY :

1. Demystification of science :

The basic principles, concepts and contents in various branches of modern science explained to the layman in the field (in any area of life) in their idioms and colloquial language to help them to build their own techniracy (Technical literacy).

Inadequacy of language

All languages have limitations. The use of words have different connotations and meanings in different contexts.

2. Deprofessionalisation of Education :

Sharing of knowledge through participatory interactions and involvements to resolve one's problems in the real life situation. It is not teaching but meeting (co-ordination/ linking) of mind process where those interested in the problem study and learn together to get their new insight and vision out of the schooled system of Education.

P.P. is aware of this problem and is trying to evolve the most appropriate, communicative terminology.

3. Deschooling society :

Making the best of the latest knowledge available to all without any formal system of education where entry points, grades, examinations, certifications etc. are the constraints to earn higher knowledge. Earning of any level at any time is taken as birthright.

4. Eco-Economics :

In nature the whole ecosystem runs on energy exchange carried through the food chain. All energy harvesting, conserving, investing is carried in energy equivalent terms. In human relations the exchange goes in terms of monetary system that is governed on demand and supply principles & not on basic principles of energy equivalence as in the Ecosystem.

Economic thinking based on these new understanding of weaving of Ecosystem is called Eco-Economics.

5. Eco - Humanhood :

In pursuance of this approach further Networking of all aspects of human life and living on basic ecological principles as are known today is called Eco Human Hood. The next part (under completion) of this book 'Plenty for all' deals with these aspects.

6. Experimentally involved :

Sense of belonging and togetherness till the success in the experimental ventures is achieved.

7. Global Village :

The present progress in informatics has made possible networking relevant knowledge to any neighbourhood to help it in enriching and enhancing its neighbourhood resources (human resources, institutional resources and natural resources such as Sunlight, Land, Water etc.) So the neighbourhood can flourish to represent the global wealth and prosperity in the vicinity.

8. Nitrogen Cycle :

Though nitrogen is the major constituent of air, plants cannot take it straight from the air. There is a long chain of activities that go in creating constituents of proteins in living cells and also getting bio-degraded at the end. This cycle is called Nitrogen cycle. Some details of this cycle are given in the book and other critical details can be had through network of information communication of Prayog Pariwar.

9. Harvesting the Sun (Networking the Sun) :

The term harvesting the Sun is now modified to the new term Networking the Sun. The word harvesting carries some stigma

of over exploitation of nature's inbuilt potentials. (as harvesting oceans etc.) The word networking removes this stigma of overexploitation and emphasizes the symbiotic process of growth in the ecosystem.

10. Mini Universe (Village as a mini universe) :

The present knowledge of ecosystem weaving by nature gives us various clues to make every neighbourhood realise represent the entire potential of the universe along with Plenty, Peace and Progress in the system are in to Natures present web of complex ecosystem built before human race entered in it. Human race has a mission to take this model in each and every vicinity of this globe.

11. Natueco Culture (Natueco Farming):

The manner in which nature has built this entire ecosystem is now well disciplined by latest modern science. Bringing these principles of healthy ecosystem networking of nature in our farming system by understanding these principles critically is termed as Natueco Culture. A better term for this as suggested by many is Natueco Farming (Nature's Eco-system style farming; for details see chapter five)

12. Nature (Natueco) Home Farming :

Farming done on limited natural resources with minimum external inputs (cash or kind as in nature's weaving of eco-system) to cover all major needs of a family of five with promise of high standard of living (for details see chapter six)

13. Nature (Natueco) Market Gardening :

With Natueco Home Farming the new type of producer-consumer society (Prosumer society) will evolve. Most of the current market interventions created by polarising commodities will then vanish. The only market will be for Energy Plantation and so will be of the type of Orchards Gardens or permanent plantation in place of current practices of commercial agriculture.

The energy will then be marketed through the grid system. All other needs will be covered with new type of nature friendly polyhouse home farming.

14. Neighbourhood Informatics Information Networking :

Knowledge brought in the neighbourhood through multimedia network. Symbolically if N = Neighbour hood, N¹ = network K = knowledge then -

KN¹N = Neighbourhood informatics

15. Neighbourhood Resource Networking :

Neighbourhood includes Human resources (Individual-family and institutional) and natural resources. Solar insolation, light, heat, land (minerals, rocks, soil, dust) water (rains, humidity dew, ponds, fountains, streams water reservoirs, underground water, clouds, most rivers oceans & waste water etc.) air, wind, climate, weather, gravity, cosmic radiation, electro magnetic waves etc.) if

N = neighbourhood N¹ = network and R = resources, then symbolically NN¹R is P.P's method of its interlinking

Through enlightenment & empowerment of human grey matter (KN¹N) = (N N¹ R) for enrichment & enhancement of resources.

16. Non-system Network Approach :

Instead of using the present system, or improving it, or trying to change it, the whole approach of P.P is to withdraw from the present system and to define a new path for enrichment and enhancement of resources through venture development amongst the masses through the process of demystification and deprofessionalisation of knowledge.

17. Pumping out Entropy :

Entropy tries to increase disorder in the system while living organisms build more and more complex order through the already existing disorder in the entire process of its metabolism, as its survival rests on the principle of pumping out (entropy) disorder outside its system.

18. Prayog Pariwar / P.P. :

The term Prayog signifies experiments in any area of life and the term Pariwar signifies sense of belonging and togetherness till the success in the experiments taken is achieved. It is a new type of trusteeship where the motto is amateurs in the field of experiments should be helped, participated and protected.

19. Rurbanisation :

A process where the benefits of both urban and rural living are well amalgamated removing the present polarisations and pollutions from both systems of living.

20. Resource Literacy / Illiteracy :

Knowing & understanding how nature, by using the same resources as are in our neighbourhood, has built this enchanting, ever-enriching, bewitching maze of the ecosystem is termed as resource literacy. Those who are ignorant of these processes are resource illiterates.

21. Sagriculture :

Agriculture in which sun, science, sharing (of knowledge & natural resources) and sovereignty (freedom to take decision) predominate is called four S (sun, science, sharing and sovereignty) or simply S-agriculture or Sagriculture (for details see chapter seven)

22. Shri Mouni Vidyapeeth :

One of the foremost of the fourteen Rural Institutes founded after Radhakrishna report of which world renowned educationalist Shri J.P. Naik was the pioneering visionary.

23. Swadhyaya :

Swa = Self Adhyaya = study that is self study networks

24. Swashraya :

Swa = Self Ashraya = help

that is Self help networks

25. Techniracy :

Techniracy is basic technical literacy for understanding the first principles behind any technical system.

26. Venture :

Venture is the capacity to take calculated risk on the strength & relevant science principles to resolve any problem in one's real life situation

27. Venturananda :

Venture = as explained in 26

Ananda = Joy

Venturananda = One who takes joy in developing, spreading and upgrading ventures.

This is the nickname given to the Author of this book by his close associates.

28. Whole plant use (whole system use) :

In nature, every plant, every living and non-living thing and system has multi-dimensional and varied potentials that can be of most appropriate use at various levels in weaving various schemes. Nothing in nature is irrelevant. With proper insight in these potentials, one who is an entrepreneur can make the best of it's use to resolve one's problems. P.P.'s Venture format provides this strength to the masses.

In agriculture, specially in Natueco Farming all the bio-mass produced by variety of plants can provide not only the basic needs as is presently assumed by commercial agriculture but can improve the form & fertility of the soil to get optimum yields in any crop of not only fiber, fuel, fodder timber etc. but even quality grade energy such as alcohol, bio-gas, petrochemicals and electricity too, alongwith raw products for various industrial processes, such as glass fibres, silicon chips etc. More details are in Chapter Six.

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Chapter - 1

Introduction

- 1.1 Evolution
- 1.2 Background
- 1.3 The Vision
- 1.4 Man's role in eco-system enrichment
- 1.5 Criteria for measuring prosperity
- 1.6 Total Life Action

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Recent progress in biochemistry, molecular biology, electronics and plant and animal physiology has opened a new vista of all round development in each one's immediate neighbourhood. These branches of science have now enlightened us on the Nature's process of weaving the complex web of the ecosystem. In this book we show the process through which human intelligence can use the same Nature for generating wealth and prosperity for each and every human being.


In place of the term 'use Nature', 'Networking with Nature' is more appropriate. What do you feel ?

1.1 Evolution

All through the evolution of the biogenic life process, **Nature** has succeeded in averting limitless disorder and chaos, which is a consequence of the law of increasing entropy in thermodynamics. Through evolution and through natural food chains, Nature has succeeded in weaving a highly complex ecosystem consisting of living organisms with more and more and better and better "information enrichment and communication". Human beings are at the apex of this evolution. Human life is the most complex organism in this universe and it has built up various subtle ways of information-creation (symbolic, artistic, etc.), information gathering, information preservation and information dissemination; through various types of tools, gadgets and equipments.

Thus Nature in spite of its limited resources and in spite of the two laws of thermodynamics, has achieved the feat of pumping out entropy to build most complex and superb ecosystem.

 Refer Shrodinger
Order, Disorder
and Entropy;
Life, Mind and Matter.

 Refer G. N. Alekseev
Energy and Entropy

Prayoga = Experiments

Pariwar = Sense of belonging and togetherness till the success in the experiment is achieved.

The challenge before the present generation of humanity is to understand and simulate these processes.

The new methodology called **Prayog Pariwar (P.P.)** has well succeeded in these processes :

- i. through Neighbourhood Resource Networking.
- ii. through accessing the latest of the international knowledge-networking, in the neighbourhood itself.
- iii. and through de-schooling society and de-mystification of science.

1.2 Background

Use these margins as your Personal Space
- to comment, appreciate or raise new questions,
- to improve, enrich and synergize the content.

Prayog Pariwar finds that the so called elites, intellectuals, educated professionals have schooled thinking and are more resource-illiterate than rural people who are more near to nature and environment and to primary elements like the sun, wind, clouds, water, soil etc.

In Nature's scheme of harvesting the Sun, water is an external input that is brought from oceans to the land through the rains. Enormous energy is expended by Nature in doing this. Our administrators and economic policy makers have so far failed to grasp this truth. Till today we have taken water as nature's most free gift.

Optimum harvesting rate

The nature's optimum rate of harvesting the Sun is about forty grams of dry matter, per square meter of area, per day. The major constraints in falling short of this optimum are-

- i. the coming solar light needs to be harvested the very day and it cannot be retained otherwise on this earth as it is radiated back in the universe the very day;
- ii. this harvesting can only be done by mature green leaves through photosynthesis.

Learning & Growth are enhanced through Inter-action.

Prayog Pariwar's Success

Prayog Pariwar has established that the rural and urban people can be enlightened in this process of optimum harvesting of the sun at any place on wasteland or terrace land. This is done through the process of de-mystification of science and de-professionalisation of education.

The increased grape and other fruit production already obtained in the drought-prone areas of Maharashtra State, by small farmers (holding 0.5 to 2 acres holdings) have reached an annual turnover of Rs. 500 crores.

Rainfall of 12" is more than sufficient

It can be shown that even a minimum of 12" of annual rainfall or equivalent water supplied from a distance of 50 kms. is sufficient to harvest the sun and create wealth worth Rs. 2,000 to Rs. 5,000 annually in one form or another, (Food, Fodder, Fuel, Fibre, Fertiliser, Fish, Flesh, Industrial wood, Oils, etc.) on an area of about hundred sq. meters or 1000 sq. ft.

Please understand the phrase 'Harvesting the Sun' as 'Networking the Sun' wherever it appears in the book.

The record yields obtained by our Krishi Pandits (Agri-experts). These are further examples of our agricultural potential in many other crops.

1.3 The vision

1. P.P. calls its method “**Natueco** (to be pronounced as **Nacheko**) **Culture**” to distinguish itself from so called Natural Farming. Natural Farming is done more through merely trusting nature and using natural products, than through knowing nature at its best. Natueco Farming is a praxis (practice) followed by knowing and understanding Nature more, better and deeper. It rests more on new knowledge input than any other external material inputs (fertilisers, pesticides and hormones, etc.).

With Natueco Culture we can now intelligently and efficiently collaborate with Nature in pumping out entropy and building abundance and all type of wealth generation through harvesting, conserving, preserving, investing, using and spending the daily available solar insolation reaching our planet.

Refer comparison between Natueco Culture and Natural / Organic Farming on page 74.

1.4 Man's role in Ecosystem Enrichment

1. Nature has evolved and maintained this Ecosystem through its food chain.

The term 'Man' wherever it appears in this book is without any gender bias and should be considered to represent Human beings (Men & Women).

Periodic severe droughts & drying in savanna, periodic ice ages etc. are other examples.

Man has enlarged this energy chain by harvesting other types of available energies on this planet (of waterfall, of wind, of waves, of geothermal radiation, of coal, etc.). Nature is incapable of using fossil energy to pump out entropy from this planet. In Ecosystem scheme, aging of forests necessitates burning of forests to re-establish the mineral nutrient chain in the system. Man has used fossil energy to further the complex survival of the planet through its new technologies in space science and electronics and in radio beams etc.

2. Man is a tool using animal

Domestication of Fire is the starting point of our Industrial Civilisation.

As man is a tool using animal (a unique gift of nature) man needs energy at every step of his life and living. (These we now name as small or big industries and transport and communication systems and processing industries etc.). But the stock of fossil energy is rapidly exhausting.

The age of hydrocarbons (fossil energy) is necessarily changing to the age of carbohydrates (harvesting the sun).

3. Decentralised activity

Harvesting the sun is necessarily a decentralised activity. Land, solar insolation and human minds and hands are to remain necessarily decentralised entities forever.

4. New techniracy (Technical Literacy)

Through demystification of science and through proper experimental dissemination of it, people can evolve their own Techniracy to fit in their real life situations.

So they can become free of the present day institutionalized education & much advertised “packages of practices”, commercial markets, and technology transfers or GATT like maneuverings.

Search examples elsewhere.

P.P. experiments have amply highlighted this potential of the common masses to define and evolve their original techniques through first hand technical literacy (Techniracy) in place of the current widely professed packages.

5. Higher Middle Class Level of life and living

The efficiency of harvesting Sun energy through biomass is such that merely 1% to 1.5% of the total solar insolation reaching at a place gets harvested. But even with this low efficiency of harvesting the sun, even wastelands and open areas like terraces can be made fully fertile by use of P.P. methodology.

P.P. is now establishing that even by using scanty rainfall or merely the waste water from the household of a family of five, one can achieve a target of higher middle class level of living in India, on an average area of about 10,000 Sq. feet (one tenth of a hectare = one fourth of an acre).

About five hundred liters of waste water per day per family of five.

6. Interactive Informatics

P.P. is now trying to evolve a system of 1. Interactive 2. Involved 3. Innovative 4. International, 5. Integrated 6. Information 7. Informatics in place of a pre-packaged computer expert system.


1.5 Criteria for measuring prosperity

1. Wealth is not only money or commodity circulation. Commodities & goods are to be created transported stored displayed sold and used. All these operations consume energy. So the prosperity of any nation depends on per capita units of energy conservation and consumption.

Real Concepts of Wealth :

1. Efficient equitable use of energy while fulfilling various human needs.
2. Constant upgradation in the ecosystem functioning.

The technologies of creating energy from bagasse & other organic wastes are now available to upgrade harvested solar energy.

 A critical paper on 'Eco-economics in Agriculture' is available.

Japan or USA are taken as norms of richness on the basis of their energy usage and quality of life. The present norms in Japan, USA or developed countries leads to affluence for some, but not to prosperity for all.

The basis of prosperity are the creation and availability of plurality of choices, possible within the constraints of the ecosystem, to lead a lifestyle as the people see fit according to their value systems

The vision of Prosumer society in Natueco Culture promises prosperity to all, comparable to even the standards of living in the developed countries like Japan or the USA without wasteful energy expenditure by curbing false consumerism through proper prosumerism.

See Appendix:
Invisible Open University.

P.P. believes that every consumer of energy must also be somewhere a harvester, preserver, & conserver of energy.

Such a system can work on energy-equivalence exchange units, in place of present political economics that is run on money exchange, controlled and channelised by demand and supply mechanism of goods. P.P. believes that this will lead to a new system of Eco-economics in place of present system of political economics.

2. Japan's norms of richness

Japan for example is taken to be a prosperous country in the world. In Japan per capita daily consumption of energy is about 10 electrical units (KWH) or ten coal units. In India if we can optimise our daily harvesting of sun as per Nature's efficiency of harvesting through biomass, then 6000 sq. ft. area of solar insolation will be more than enough to harvest 10 coal units per day, per capita.

With modern science and especially the new insight in molecular biology, we can double or triple this photosynthesis rate in the near future. So we can make every rural family of five capable to be as rich as a family in Japan at present and that too more convivially and with only the input of the latest of the science and knowledge in a de-mystified way. In this, illiteracy is not a bar. In fact, this potential for enrichment through knowledge and science, can itself be the much sought after motivation for the myriads of farmers to acquire functional literacy. It is important to realise that knowledge is an input that doubles with each investment and knowledge is the wealth through which all other forms of wealth are generated.

1.6 Total Life Action :

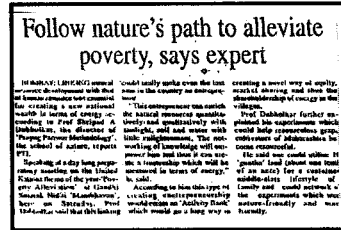
Expanding this approach further, Networking of all aspects of human life and living on basic ecological principles as are known today is called Eco-Humanhood. The forthcoming book : 'Plenty with Peace for All' - or 'Eco-Humanhood', will cover the aspects for total life action. It will highlight -

- New paradigms in non-institutional networking for collaborations in dissemination of latest science to masses through de-centralised, de-professionalised, de-mystified Venture Formats.
- New type of Interactive, Involved, Innovative, International, Information, Informatics through Multi-media & Hyper-media, Global Networking for operating Open Learning Systems as an Invisible Open University.
- New insight on ancient Yoga and Ayurveda.
- Eco-economics a New Economic Paradigm
- Child health, growth, education and development.
- Happy, healthy, productive old life.
- Full enlightenment of sex life to all age groups unfolding them to how it is natural, wholesome and beautiful.

The P.P. methodology of Neighbourhood Knowledge and Resource Networking is not limited to solving problems of subsistence alone but is applicable to all aspects of life, providing a Total Life Action which offers a richer life of abundance and plenty, which is at the same time full of expression and creativity. It is based on constant enhancement and enrichment of our total eco-system as opposed to present approaches of encroachment and encashment.

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Refer Appendix :
News in 'Freepress Journal'.



Further information on various Ventures is available.

Chapter 2 :

Biographical Background

- 2.1 My early life
- 2.2 Swadhyaya : Self study courses
- 2.3 Conclusions from experiment
- 2.4 Criteria for contribution and collaboration
- 2.5 De-schooled Education, Education for Development
- 2.6 Experiments at Mouni Vidhyapeeth
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Research and Innovation
- 2.9 10,000 letters 10,000 recruits
- 2.10 Varied interactions
- 2.11 Exchange directory
- 2.12 Interaction abroad
- 2.13 The scientific grape revolution

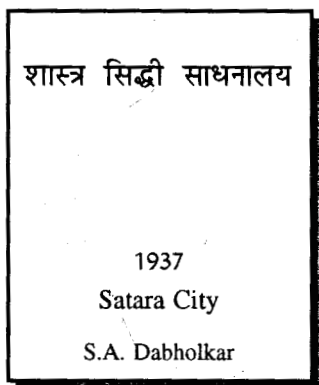
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2.1. My early life :

The interesting and exciting story of the emergence of "Prayog Pariwar" or the Networking of Self- Experimenting Learners is closely linked with the story of my own life and aspirations. Since youth, I believed more in my own experiences and expressions, rather than in any sort of academic character building. I have always had an inner urge to take every aspect of my life as an experiment for me, for a fuller, richer and more meaningful expression of life. Luckily I came from a large family in the middle class. We are seven brothers, three sisters and two more cousin sisters living together. I am the third eldest. My father was a well-known High Court lawyer and my mother, happily now in her 94th year, is a very cultured, well read, considerate mother, though her school education was terminated at the age of twelve. It was her constant fresh approach towards life, and her appreciation of my eccentricities, that gave me the much needed moral support in my varied experiments. The words of our great poet Rabindranath Tagore, that real education must make us "vitaly savage but mentally civilised," have been a watch word for me since my twenties.

The first major shift in my outlook towards life took place during the 1942 Quit India Freedom Struggle; I was then a university student preparing for my science graduation. The 1942 struggle made me feel strongly, and in a very passionate way, that in a country of ignorance and slavery, it was a sin to build up an individual academic career.

A regular internal news bulletin 'Mai Samachar' networked amongst the family members (now almost 100 !) spanning three generations, is a source of family pride and warmth, worthy of emulation in any family. See Appendix.



Along with this, I began to feel the need to share with the common masses, all the major principles and possibilities from the field of science and knowledge. I began to dream of a new “Sociology of Science,” emerging as a powerful tool to reshape the destiny of our people.

In that period I used to walk among the people in the countryside and also lived with them. I tried to cultivate a small organisation at that time called “Shastra Siddhi Sadhanalay” meaning “let us share and serve science so that science can serve us with its blessings”.

In that mood, and with this vague vision during the entire period of my college days, I undertook, on my own, various graduate level studies. Physics, Chemistry, Mathematics were my course subjects. The subjects I particularly liked and studied were agricultural sciences, biology and especially botany. I also studied psychology; Freud especially. I studied, practised and helped myself in Yoga and medicine. I studied different Social Sciences. Sociology, political sciences, economics, philosophy and anthropology too. I also shared my readings and had discussion with other college-going members of my large family. It became my second nature to study and devour every new topic that I came across.

2.2 SWADHYAYA : Self-Study Courses

By the time I got my post graduation in Mathematics, our Nation was a free sovereign state. Various universities were springing up and various external high-school certificate and university degree courses were being started. In this situation it was a great opportunity for me to start “Open Self-study Courses” in different subjects, to who-so-ever was in need of them, for University degree examination or for high school certificate courses (“Swadhyaya” means method of self-study and progress). This endeavor was operated by me single handed. It soon became very popular.

The student participants were of varied educational background and competence, of different age groups, from different communities and of both sexes. They were eager to become assimilated and identified in this new type of institutional structure. When I had started these activities my capital amounted only to a chalk and black-board. But within four months it became a full-fledged institution. This growth was solely due to the participants contributing. It also earned for me, a remuneration, which was more than the pay drawn by the contemporary college Principals nearby.

This new activity was located in a small commercial town with a population of about twenty thousand. There were no colleges and the only educational institutions were four big high-schools. In spite of the small population, the number of student participants made me design and evolve a novel system of card-unit work. With this card unit setup the whole group began to function as a learner and teacher. In this self-study group, gradually I had the least amount of work left to share.

Details of these experiments are available.

Knowledge & Communication -
The Perennial Assets :

My thesis was simple. As a group, the knowledge that I once handed over to the group, stayed always with the group and perhaps every individual in the group would have some additional information of his own, which helped the others. This system worked like a tonic. Everyone was also entitled to get, in return, due remuneration in credit or money form.

This initial experience in the techniques of teaching and knowledge communication was exciting and warming. Before proceeding to elaborate and scan other similar experiments, it will help to record some of the major features and conclusions of this first experiment in knowledge-communication.



More information regarding this novel learning method is available.

2.3 Conclusions from Experiment :

1. It is always possible to work as a team, even in a heterogeneous age group. The only condition for this is that the members' feeling of sharing and involvement for their common goals must concur.

The majority of the members were adult drop-outs, failures in their regular class studies or elderly women. It must be noted that in India's social system, the opportunities for higher education for women were rare.

2. Intrinsically, there are no basic inadequacies, in any rational human being, that should bar him from acquisition and use of any type of knowledge, that he needs for his personal development and use. The so-called inadequacies are falsely built in the person by the closed and discriminating system of social practices and educational pre-requisites. Many of the participants in my experiments had been drop-outs at an early age from their primary schools.

But on getting the new insight in the method of self-study and expression, they covered their entire school course in a period of one and a half years and were successful in getting their certificate of high-school graduation and later even pursued further college studies.

3. I never had to impart teaching, coaching or tuition to any one. It was not a class in the regular sense. My methods were -
 1. to make one understand the form of the subject under study, its conceptual contents, the catchwords and the terminology mechanism used while presenting and developing it,
 2. the relationship of ideas and topics and
 3. some common analogies and illustrations from their own life situations, and

4. all this in the students' own forms of expression. This helped to build up a clear communication between the students and me and within the group.
 5. In about fifteen to twenty sessions at the most, I treated the subject and
 6. for the rest of the year I allowed the students to work out the rest of the subject themselves, with the aid of my card-sets.
 7. They also interacted with text-books and
 8. with any one in the group whom they thought could help in having their difficulty discussed and resolved.
4. I had found out on my own that certain types of card-sets were helpful and sufficient to build up various types of knowledge communications and interactions in the group. The cardsets provided them with a stimulus (and an opportunity) for an exploratory, creative, well defined, planned experience.

These cards related to one of the following functional units such as

1. Acquaintance units
2. Information units
3. Knowledge units
4. Cross reference units
5. Expression units
7. Study units
8. Discussion units
9. Continuation units
10. Credit units
11. Achievement units
12. Direction units
13. Record units
14. Original observation units
15. Original contribution units



Sample sets of such cards as computer printouts are now available. Refer page 50.

Sub-units were added to each of these units with a double folder, so as to be objectively administered, related and studied.

These cards and units were allowed to mix in any sequence according to individual need, level of understanding, skill of reproducing, and so forth. This mixing process provided the necessary feed-back; It made me understand the talents in the group, the shortcomings of every individual and also the inadequacies of the card-sets.

5. In this manner various card-sets were designed, covering different ranges in school and college topics and subjects. These cards gradually grew through the interaction of the student participants after understanding their problems and limitations. These were never artificially coined. The participants felt so free and familiar with these cards that they used to take them as their syllabus and curriculum instead of the routine examination syllabi.

2.4 Criteria for Contribution & Collaboration :

There were six clear and specific criteria relating to the participants' contribution and collaboration and active involvement in the open courses. For each course one had to contribute in cash only once until one achieved success in it. This purpose was very clear to each one of the group; so within four months of the inception of this scheme, our group became the best equipped and best furnished, new type of self styled educational institute in the area.

Its reputation along with its economical potential grew with amazing rapidity. Even students from advanced educational institutions at far off places, used to come for at least a few days and benefit themselves.

This was so because they were able to discover their own syllabus of study in our card-sets, and not in the academic syllabus in their institute.

Soon a second branch of our institute was opened at a place 50 kms away. I used to visit this second place only on weekends and the course worked more efficiently than at the original centre. The achievements and annual results of the participant student further went on adding to the name and fame of this new approach in education. The family members, relatives friends and neighbours of our students were so much enamoured by the participants' talks about me, that they used to urge me to visit their homes to get their other personal problems understood by me.

The six criteria for which money was charged at entry-time were as follows :-

1. Maintenance of the Institute.
2. Development of the Institute.
3. Provision for new activities and research.
4. Insurance against emergency.
5. Support for the slow learners in the group.
6. Earnings of the working group including my self.

With this early success in group motivation, group participation and group involvement in the open scheme of total education, and along with the realisation of a self-supporting spontaneous organisation, my passion for exposing myself to different life situations increased. Since then I have built up a habit of taking a clear forty days holiday every year from all sort of routine activities. During this period I am on my own and go to some odd unknown place. I then live in an altogether fresh situation and away from my acquaintances. On some of those holidays I lived the life of a tramp and moved on foot like a beggar "Sanyasin" among the people of villages with a different mother tongue and environment.



Information on these interesting experiential journeys and learning experiments can be availed.

More info on the cash box scheme is available.

At times I lived like a born-knight of the past, camping on some old fort by organising a forty days romantic stay.

Sometimes I lived in a very luxurious holiday resort in the Himalayas. At times I experienced the life of a devoted disciple or saint in some holy ashram of repute. I lived and moved amongst tribes to learn their life through their songs, dances and style of living. At times I devoted myself to mountaineering as that was second nature to me. I also enjoyed organising big family camps of more than forty persons. In the camps the participation was free and an *open cashbox scheme* was worked out to cover the expenses. Throughout this period till the age of thirty-five I remained and lived the life of a very eligible bachelor, enjoying its freedom. I was then scrutinising for myself the subject of sex-life. For this I made a close study of more than five hundred married couples and tried to design a system of ten thousand tally questions to build up a happy fruitful married life. I may add here in passing that it took one year's painful decision making for me before I finally entered the wedlock at the age of thirty-five. Luckily for myself my wife had a complementary nature to mine and the notion that the institution of marriage will limit my freedom turned out to be untrue.

Choiceless Awareness

All these forms of varied experiences and experiments enriched my life. I began to realise that knowledge abounds everywhere in such a varied form that it is difficult to consolidate it in any system and then to hand it over to others. I began to understand that the scope of my open course activity was very limited and academic. Moreover it was very difficult to build up an open knowledge communication system through an institutional form. At every juncture of involvement with other groups, I found that the urge for more and better knowledge and free involvement was always latent in every individual, at every place and in each field of human existence.

It is always waiting, ready to take spark and flare and to build in oneself, one's own kindling light, for better radiance and delight. I began to understand that just as the law of universal gravitation pervades the world, so also in the field of all life phenomena and especially in the human form of life process, there is the all prevailing law of "Choiceless awareness" abounding in and around every individual. Just as the force of gravity cannot be screened and always manifests itself, so also the choiceless awareness always expresses itself. This awareness then builds up many types of adequacies in us, by urging us to experience and express in different life situations and further urging us to communicate with others in a free, untainted way. This choiceless awareness always encourages us as independent and creative individuals to deal successfully with our problems within our limits and resources and also urges us to join with others in doing so. Thus there is always a latent quasi-experimental "Networking Action" trying to spring up and assert itself.

✎ Your space :

2.5 De-Schooled Education, Education for Development :

The analysis that I have presented above was not very clear to me earlier; after some time I rapidly began to lose interest in my own activities in the open courses. I began to pine for a complete breakthrough from the whole system. By nature I was not the type suited to permanent institutional form of any type. It was some time in the early 1958 that after eight years of successful experimentation of open courses, I closed the entire activity. It took me one full year to wind up those courses. There were various types of personal, social, structural, administrative, economical and emotional involvements which had to be dissolved in a detached manner.

I used to muse how easy it was to build up any form of superstructure in a society, but how difficult it was to get it dissolved on its own.

I did not know then that I was unconsciously urging to “deschool myself” and the system of my own creation.

I had begun to sense that I was permitting myself to be used as a tool rather than keeping myself free to grow and mature on various limitless frontiers of human life that I yearned to discover and probe for myself. However, it was the institution of my own flesh and thinking. I still vividly remember how while closing one by one, the different wings of the entire system, I used to hum to myself the lines, “This is the end of tears, no more lament”. I was closing the work when all my relatives, friends, neighbours and students had taken it for granted that as I was doing well, I would settle for life in that promising new educational enterprise. It was then the beginning of the boom period for educational development in India and especially in my home state of Maharashtra. When in the midst of this I suddenly switched away from it, many took it as a crisis of my unmarried life; some felt that it was my craze for some different venture in a different field of life. When I now turn back and reflect coolly on this episode, I feel that the roots of my present efforts to design non-institutional forms of knowledge communication and learning exchanges, are somewhere hidden in those intensive experiences and experiments in the past.

So in 1958, I was a free-lancer again, free to move and work and get involved in any field of life. Many fields were by then calling my attention. I was thinking of leaving India for some time and going on a tour of our east Asian neighbouring countries. I also felt the desire to renounce every thing and go deep in the study of our ancient Yoga system. But another better alternative arose that was very inviting and promising for me.

A new centre for rural higher education was taking shape in Maharashtra.

It was one of the foremost amongst the fourteen innovative institutes springing up in different parts of India. These were designed to function on the motto “DEVELOPMENT THROUGH EDUCATION AND EDUCATION THROUGH DEVELOPMENT”.

I was tapped and with a great joy, I joined this budding experiment.

2.6 Experiments at MOUNI VIDYAPEETH :

The Institute “Shri Mouni Vidyapeeth” is located in a rural setting with a beautiful refreshing natural surrounding. At least 55 Kms away from nearest urban centre, it has a very good campus, which, at the beginning was to be developed into a true community type full fledged residential centre. The institute was expected to function by taking various educational involvements in the surrounding rural community, comprising nearly a hundred villages. It was also expected that the institute would take to research in various sets of rural problems. Multiple facilities (conveyances and like) were provided. Various types of courses, from pre-primary to post-graduate and Ph.D. level were opened. Training institutions for primary and secondary education were established on the campus. The Ministry of Education, New Delhi had sponsored a special course equivalent to degree courses in other universities, but with more emphasis on rural problems. There were courses in the fields of social work, co-operation, civil engineering and education. Special efforts were made in running adult education classes, continuation courses and single teacher school programmes. Peripatetic and short term courses for elected leaders of village panchayats, composite courses for class-one development officers at district and block levels with their subordinate extension officers and with the elected members at the district level were and are still organised.



Shri J. P. Naik, world famous educationist, the founder of The Mouni Vidyapeeth.



More details are available on Mouni Vidyapeeth's achievements and on the unique three years struggle for restructuring the old constitution, by the entire people of the area, two hundred & fifty staff members and five thousand students.

In leading this struggle I got a still deeper insight on how the social mind is mobilised for out of the type ventures in different areas of life.

Training courses for village workers, activities for women and child welfare centre were designed. New extension agencies in agriculture, in family planning and in medical aid and health were all simultaneously initiated and worked out. A total staff of more than two hundred persons including the peons or class IV workers was absorbed and engaged from the very beginning.

In the year when I joined, it was a fresh new educational complex inviting the energies of the staff and the workers of the institute for original and genuine contribution in the field of education and rural reconstruction.

This wonderful budding educational complex provided a pleasant situation and opportunity to me. In a way I felt myself very familiar with the complex mode of educational activities, and in the first three or four years I was quite absorbed and at home with the new framework. I was actively engaged in various types of extension and teaching activities in the institute. At times I worked as a resource person, at some other times as a guest lecturer; at some places, I was a regular or honorary staff member, at some other places, a worker of a self-designed project. People who learnt of my previous experiments in open courses urged me to build up a new nucleus for such courses. I made an open call to various staff members to undertake to teach any subject that they liked most, irrespective of their academic qualifications, to whosoever wished to learn it. No fees were charged and no regular remunerations were given. The entire manner of covering syllabi rested with the learner and the guide friend. It worked smoothly and successfully. Without any type of institutional form or pressure, more than hundred students received their secondary certificates as well as their much coveted university degrees by studying at any odd free time that they and their guide friends found suitable.

Most of them were married young ladies from nearby families, as also ambitious primary teachers from nearby villages.

2.7 System kills & kills absolutely :

However, before long, I began to get disillusioned about the thesis of bringing a change in our complex rural life through various institutional activities and training. In whatever way the institutions may work, the structured curriculum of the system kills all the germs of creativity and originality.

It especially became very vivid in various kinds of institutional types of learning activities. (I mention later the glaring defects of our present day educational extension work, in comparison with the new network of learning). The failure of all the fourteen rural institutes set-up by Government of India, in achieving the objective of rural reconstruction through institutional type of educational programmes became glaringly apparent so soon, that in the well known "Kothari Commission Report on Education" the idea of Rural Universities was dropped once and for all. The hope that such universities would do some better work than other urban universities also vanished with it.

Refer Chapter 8 page 194.

This close and deep, though negative, insight in institutional form of knowledge communication, helped me later in designing a non-institutional type of network for learning exchanges.

But before we get into that, I will narrate, briefly, my other activities and experiments in the institute, that in 1966 suddenly opened an entirely new avenue for me to work on.



2.8 Experiments in Agricultural Productivity

Research and Innovation :

I have had a love for experimenting with plants since my early school age. My mother is still proud of telling, how though a school boy, I was successful in growing prize pumpkins in a small earthen pot of about one and a half liter capacity. I became such an expert in assuredly getting pumpkin fruits from any pumpkin vine, at that age, that the neighbours used to call me “Pumpkin Doctor”. I used to help them to get their vines to bear fruit. This desire for experimenting with the plant kingdom flourished spontaneously in the rural surrounding of our institute. The institute had provided the faculty on the campus with living quarters and a small open space around each home.

This small space became an experiment ground for my studies in agriculture, horticulture, poultry, sericulture, goat and rabbit rearing, soil fertility building, new techniques in wasteland development, and so forth. As a condition of new experimental development from the very beginning I had made it a rule to treat myself as a farmer who is below the poverty line and is living at a level of disinvestment (i.e. under constant debt), and who has no other resources than his own free labour and the dry waste-land that he has at his disposal.

I soon began to realise that the so called packages of agriculture practices, professed by the agriculture extension agencies, were out of place in such dire conditions. The whole process needed a new approach towards the application of scientific principles and techniques. It had to become entirely a process of “building from below”. This slowly led me to evolve a new sociology of science for creating knowledge-based and a soil-based, open modern community in a developing country like ours.



1.



2.

1. 30 lemons in 20 liters of soil.
2. Good bunches of grapes in one cu. ft. of soil kept as a table top.

This whole new approach worked so nicely that exciting results began to be visible from the very first year of my experiments. In a very small area of nearly one thousand square feet, I was able to grow a variety of fruit plants, grapes, lemons, pineapples, guava, pomegranate, plantains, papaya, drum sticks, custard apple, mango and so forth. Along with this I used to grow a variety of vegetables too.

The whole place, which used to be a barren waste land, became like a forest of fruit plants, all healthy, all productive and all taking their nourishments from the symbiotic built-in-aggregate from the garden waste.



3.



4.

Record crop in Snake Gourd

Custard Apple on terrace in polythene bag; 10 good custard apple fruits.



Some impressions from the record book :

"...we were happy to see the successful experiments in growing fruits and vegetables on a small terrace. There is a lot to learn from this scientific approach and learning attitude. Many more people should know about this and experiment to eradicate the poverty in our country."
19-3-1966.

"...we had heard of deserts transformed into heavens in Israel, but closer home we could see for ourselves what is possible if agriculture is done intelligently and with a scientific approach. In this small space we could see prolific varieties and quantities of gourds, cucumbers, lemons, guavas, papayas, grapes, bitter gourds, and what not. His experiments prove that you can get good crops even under the shade of larger trees."
11-7-1966.

Visitor studying the effect of girdling on mango crop.

I also added poultry, goat, rabbits and sericulture to this and my small garden became a sensation to everyone in the locality and to anyone who came for training or a study course in our institute. In the aftermath of this success, about thirty people used to visit my work everyday, to discuss and understand my approach and write down their impressions in the record-book I had maintained.



They used to leave their addresses, hoping that if I started some courses on these experiments, they would be informed and could take advantage of. In this way, over ten years, I gathered a list of more than ten thousand such visitors. In a subsequent section on "Network of learning exchange" I elaborate on the experiments mentioned here.

2.9 10,000 LETTERS 10,000 RECRUITS.

The food conditions in India in early 1966, inspired me to give a "flash report" of these experiments in one of the most popular Marathi magazines (Kirloskar). It was at the end of 1965 that the war with Pakistan was fought and won.

But the food situation in India became suddenly strained. The editor of "Kirkoskar" magazine knew by then that I was brimming with various types of exciting agricultural productivity research and innovations, and that I had worked and proved all these ventures in the down to earth conditions of a common man. This magazine had the highest circulation among the Marathi intellectuals and middle class readers and among many farmers and active village workers. I was asked to write and participate in editing a new styled supplement of twenty-four pages, substantiated with photographs, pictures, illustrations and charts.

The supplement was published in the January 1966 issue. This "flash" worked and created a sensation and stir among the people, and letters began to pour in from all sides of the state.

By the end of the year 1966, I had received more than ten thousand letters expressing desire to undertake an active experimental involvement in trying to realise various types of the ventures I had reported.

One can imagine my excitement on receiving such a tremendous response. It was a novel situation to deal with. The cost and the organisational super-structure for a process of correspondence on distance learning courses, would have been beyond the means of those aspiring participants.

I felt I had to somehow answer each one, as otherwise they would have felt cheated, as if by some false advertisement. I would have loved to work with each of them but I foresaw the possibilities of first being made a "hero," to be later trapped and made a "scapegoat" for some unexpected failures. I wished to avoid all these pitfalls.



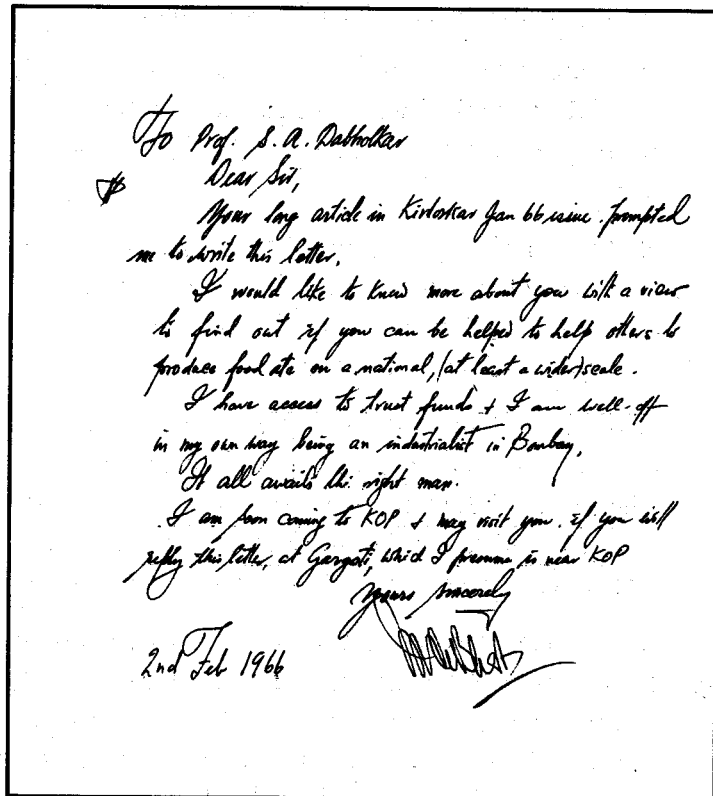
The First Flash

By that time, the trustees of one research foundation wrote on their own to me that they would like to help me with funds, of any required amount, so that I may be enabled to pursue further in my new drive on the food front and help people to join it.

This was the additional pitfall I had to get over. I knew that such external money or aid would create an artificial control and amount to an entanglement for me as well as the participants and then we would be doomed to be frozen.

Letter from
Mr. Bhatt :

" You long article in Kirloskar Jan. 66 issue prompted me to write this letter. I would like to know more about you with a view to find out if you can be helped to help others to produce food etc. on a national, at least a wider scale. I have access to trust funds and I am well-off in my own way being an industrialist in Bombay. It all awaits the right man. I am soon coming to Kop. and may visit you, if you will reply this letter, at Gargoti, which I presume is near Kop."



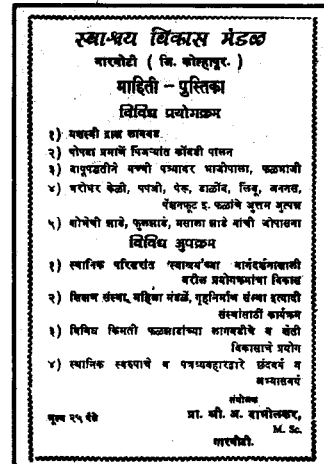
Surprisingly, right from the beginning, money, started coming by itself, and it still comes like that. But money received is never taken as a donation or an aid but is taken as a spontaneous individual contribution for sharing in the network in which he/she is involved.

I still remember those hectic days of my overflowing mail bags when I used to spend nights and days discussing with my elder brother and some of my close friends, about the nature of the network that I would like to evolve and experiment. By then I had analysed my various published activities in "Kirloskar" magazine, and had coined a new word, venture, to designate each activity. (All new terms that will come in this text are later explained in full, in part three). From the ten thousand letters it became clear to me that people had felt a pull in the ventures, as they felt that all those innovations were established by working strictly within the conditions and the limited means of the common man. Those ventures were just fitting to the real life situation in which they themselves were working, and so they must have felt quite confident to succeed in those ventures after having the necessary learning exchange from me.

Self Help, Self-Reliance

I did write back to all the ten thousand letter writers that I would let them know soon, about the nature of a new network of information which I would like to operate for their use.

So in November 1966 Divali Special issue of the same magazine, I wrote an article explaining a clear cut new design to organise this network for information. I then called this network, **Swashraya Vikas Mandal**, meaning self-help and self-reliance for building new creative constructive possibilities by working in one's own real life situations. I had developed by then, the thesis that if one had a venture that he had worked and proved under the conditions of real life situation, then other people having similar real life situations would feel the need on their own to join hands with him to get the necessary experience and knowledge (information) from him.

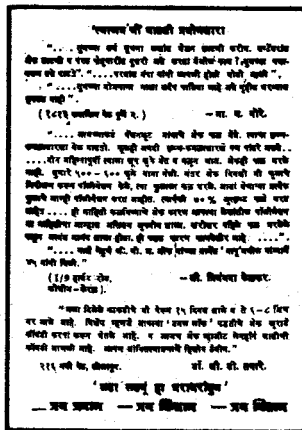


But the nature of such a knowledge-communication network became clear only after its actual trial in the field. The rules laid down for joining this new group ventures were very simple. The only cost was that of two way postage for communication files both ways. Each person was expected to have communication at least twice in every month. If there was communication break of more than one month on either side, then the involvement affair was taken as automatically closed.

2.10 Varied interactions :

After the beaming of this group venture in November 1966 more than five hundred participants out of 10,000 came forward to work with this new network of learning-exchanges. They were from far off places in Maharashtra and of different age groups, of both sexes, of different professional and social standings (professors, lawyers, doctors, engineer, retired administrators, students, teachers, MPs and MLAs, farmers, middle-class women and so on). It was a feast of experiences for me to work in this new network. There was no syllabus, no regular printed matter to send. Though they were working in one of the several venture groups like grape cultivation, poultry rearing, vegetable production, wasteland development and so forth; the individual needs and approaches were entirely related to one's real life situation and so in many ways different from the other members in the group. Thus some wished to grow grapes in pots while others desired to experiment with grapes in heavy monsoon tract. Some wanted to train the vine on the fourth storey of their house after planting it at the ground floor of their house. None of these needs I viewed as odd or absurd.

I always tried to help them by conveying to them the pitfalls they had to learn to avoid with the help of some good scientific understanding to achieve their cherished goal.



The pitfalls

As the communications began to pour in, it soon became very clear that there were two clearly different categories amongst the participants. The people in one category gave no feedback. They tried to rely more on me to get their difficulty understood and resolved. They were not capable of taking the calculated risk involved in their ventures. This group automatically lost its interest soon, and ceased to interact, and the communication automatically came to a stop.

This, however, made me analyse and understand the various underlying reasons of their expressed needs and failures. I found that the design of many of my ventures was not very close to their real life situation. Therefore, though as a first fascination they joined to work with me, later they found it difficult to continue further within their own inherent inadequacies. Some other types of ventures fitting to this inadequacies would have made them work effectively and accordingly I modified some ventures and found that the analysis worked well. They again continued in their aspiration to cover the venture.

In the early days, this network did not have any card system similar to that of my open course system described earlier. As I was against preparing any such card-sets without their interactive involvements and interactions between the venturers in the same venture design, I was not in a mood to write cards and provide them for ready references. As a primary principle and condition of building a new sociology of science I hated to provide them with any of my own action programs or knowledge thesis as a book or as a package of practices for them to refer to or imitate.

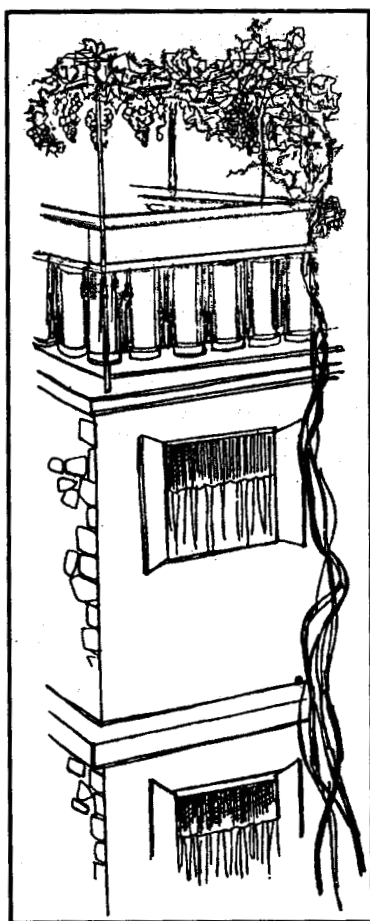
☰ The process initiated a series of correspondences which has become one of the frequently used mode of learning exchange in P.P. even today. (See Appendix for some current exchanges). Below are excerpts from some letters received then

"...I have done a chain plantation of corn. I applied the pollen for two three days. How many days should it be applied ? All the crops are bearing corn. I am following your instructions about the sweet potato creeper..." Chanda, 22-8-67.

"....the cucumber & gourd creepers get good flourishes but the flowers wither. What is the reason ? Planted some tomatoes.." Baroda, 14-8-67.

"... the garden gives me great satisfaction. Nowadays 5 to 6 times a week we eat our own vegetables, thanks to you ! We never thought we could grow so much in our own land.. Cochin, 8-12-66.

Fine tuning of the communication process.



The new assets

However the letters from the second category of participants brought a real heartening surprise. It made me understand vividly for the first time that knowledge communication is always a two way process. Many a time I was learning and knowing more from their experience and experiments, than I was supposed to communicate to them.

I would like to quote some lines from a random sample of such letters to make my point clear. A letter from a farmer from a far off village said...." I would like to confirm your method. I have also tried it some three years in the same manner that you have now suggested to me. The grape vines receiving this type of treatment, are giving a wonderful yield." A second letter from a medical doctor said, "I am trying to build poultry feed by charring human excreta at a particular temperature, and it is working well".... The third letter said "your scheme of making chicken mash from poultry droppings is working nicely. I have made some addition of fishmeal to the poultry droppings before allowing larvas to grow in it. The larvas are now quite plump and in abundance."

A letter from Shri N.G. Goray, an active political national leader said "I have now followed your methods on training the grape vine. Now my grape vine has reached the fourth storey of my house. Please send any other suggestions if you have for further training of the canes." Another letter would contain new observations based on a field trial basis in their own grape gardens, and would send tables and photographs of the results. Some tried to show from their own experiments that rearing of country poultry bird was more profitable in Indian rural situation than the much advertised high laying poultry birds of foreign origin.



Various models of poultry cages to suit different situations and locality needs (Rural, Urban, big cities etc.) were studied and developed.

One sent to me by parcel a complete new blue print and a small model he had designed for a poultry cage to be kept in one's drawing room or kitchen as he had found convenient in a densely populated city like Bombay where he himself was living.

Such cages had enabled him to rear such birds at home. Some suggested new ways of soil fertility building, some gave their new ways of training grape vines, some gave a list of new poultry medicines to use as preventives against common poultry diseases.

I can go on adding to this list upto any length but this new insight of active group participation made me work in a new way to make the original network of the learning exchange more realistic and more effective.

Common Interest Grouping for Cross-Communication

For this purpose I introduced participants having common interests to one another by forwarding to them, all the communication papers that I had got from them. This cross communication relay created a further feeling of belonging and togetherness in the entire group.

The group members began to mature very rapidly and began to standardise their own card sets of different types (see 2.3.4) that they felt would prove very useful to those who were placed in similar situations.

The network thus began to function by mutual correspondence and feed-back, and then began to express as a unit by sharing and caring for the common experimental involvements in the group.

I called this entire activity a “Cell activity” and the whole system of network “**PRAYOG - PARIWAR**”. The old name “Swashraya Vikas” was now given up and this new name gradually assumed the current status.

The word “Prayog” signifies experiments and the word “Pariwar” signifies sense of belonging and togetherness till the success is achieved.

The process of evolution of such networking did not stop at that stage but continued further. I began to think of a process where instead of my name and address, only a post box number would serve the purpose better.

This would take me completely out of the picture as a superstructure in the cell and would make the entire operation of the cell non-personal and perfectly non-institutional. Thus the outward dangers of any victimisation of the network activity by some vested group automatically became nullified.

Moreover the danger of having any initiation ritual somewhere in the network also was completely eliminated. This post box method turned every one into a venturer and also a participant at the same time.

2.11 Exchange Directory :

To make this system active and dynamic a telephone exchange-cum-directory method was further studied and introduced. It worked on the same lines as the regular telephone exchange system. In our present telephone exchange system, by simply looking in the directory one is free to try and get exchange with who-so-ever one desires. In the same manner by looking at the particular code number of our network activity one can get the desired set of addresses with whom one could communicate directly for one's own learning exchange.

The full discussion comes in Part III

At this stage one major pitfall in the working of this network was spotted and promptly eliminated. While the operation was still in a fluid stage, some people tried to earn profits from my letters by posing as altruists or as agents of my organisation. To get over this difficulty an "Activity Bank" method was introduced.

Thus, if one has to use any one's name for some reason, he was made to show to what extent the person named recognised his credit of working with the venture. Thus everyone began to deposit credit against one another in relation to experimental involvements or learning exchange and other types of help and goodwill inputs one derived from others. So it became a criterion for one's real achievement contribution in the venture.

This rapid progress of the network from Swashray Vikas to Prayog Pariwar however took nearly ten years. But at the end of 1967, I gave the first critical exposition of this network emerging (now called Prayog Pariwar) to some Gandhian social workers assembled at Sevagram, Wardha. They felt that the whole system had some close resemblance to the method Gandhiji followed in his mass movements. Here I got a new nickname "Venturananda" (one who takes delight in discovering ventures and in also relating various ventures with various other venturers).

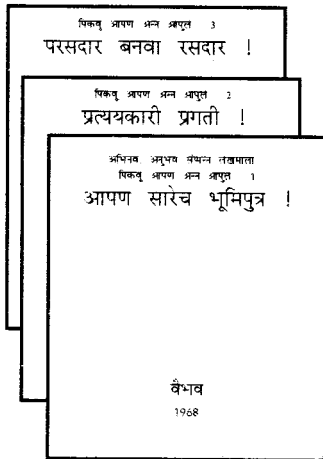
During this meeting, the veteran social reformer, Shri Baba Amte, made a pertinent observation. He cautioned, "Swashray is not limited to working with Grape growing or poultry alone, but it is an experimenting network, ever exploring new ventures which address various social and life contexts. It is important to create this awareness, otherwise there will be a convenient misunderstanding among the people which leads to fixations like Mahatma Gandhi as 'Charkha Gandhiji', Baba Amte as 'Leprosy Amte' and likewise Swashray as 'Grape-poultry Swashray', which will limit the the vast potential of this novel approach."

A second such discourse was given to a rally of one thousand youths assembled at Somnath in the then Chandrapur district. They all acclaimed the thesis (as at Wardha) as a much needed viable new tool for the much desired basic Socio-Economic transformation of life.

A Complete thesis of this new networking of experimentally involved cells, appeared in a series of ten articles in the Maharashtra Chamber of Commerce monthly journal "Vaibhav". In this thesis the history and analysis of this new experiment was given. By this time I had become a well-known person all over the State. Rotary Clubs, Lions Clubs, youth organisations, women's activity centres began to get associated with me, to get my thesis and way of work understood.

I became a resource person and was absorbed as a co-opted member on various educational, reconstructional and extension committees at National and State level, for evaluating the possibilities of using this type of new networks of learning exchanges in various fields of life such as health, education, old-age, married life, child rearing, social change, youth activities, occupational problems in agriculture industry and service by the process of chain reaction. Some experiments have been observed, but more experience in these various fields of human life and living are still required.

There is, however, a need to get deeper insights in the potentials and pitfalls of this new network of learning exchange.



The series of these articles in Marathi outline the basic approach and methodology of P.P. as it evolved in 1968. Copies of these articles and translation are available.

2.12 Interaction Abroad :

It was some time in 1972, when Ivan Illich was in India, that he came across this new approach of learning exchange network. I had given a brief exposition of this endeavour in one of his seminars on de-schooling, organized by the Indian Council of Social Science Research, to which I was an invited participant.

He felt some deep resemblance between what he was professing and what I was illustrating through our own network experiments. This introduction was to prove the basis of my being invited to participate in an international work conference on pitfalls of deschooling education held at CIDOC, Cuernavaca, Mexico in July/August 1974.

I gave two critical expositions to the working group of our work with sufficient substantiating data. Most of the participants were enthused with the new network and urged me to write a complete short thesis so as to make it available to all. Their interest made it imperative for me then to write down the method and the results.

A Declaration emerged from the Cuernavaca Conference, which voiced the need for liberating education from its present establishment approaches. An important passage from this declaration is given below.

"We believe that every person has the full right to decide and acquire any type of knowledge, in any form, in any manner, anywhere at any time. All knowledge will be freely available to all people at all times. No single institution should claim authority to be the sole entity to impart education and award degrees. Learning, earning livelihood and living must be closely and constantly linked.

When we are living in the true sense, we are learning. Knowledge is an inseparable part of Life. No person's knowledge is more valuable than of his fellowperson. It can only be different."

This entire chapter was written in 1975 for one German Publication. It is reproduced here, again, as it is, to keep the historic context.

2.13 The Scientific Grape Revolution :

Having seen this total background we can now proceed for a further analysis of this network in the forthcoming parts. I however feel that this study cannot be taken as complete without learning the fascinating story that clearly illustrates how this work has also helped a group of amateur small farmers at Tasgaon (Sangli District, Maharashtra State) to emerge as a powerful cell of Grape-Gardeners. The name of this group is "Vaidnyanic Drakshakula" (meaning in a very literal form "Experimentally involved Grape Cell Co-Workers").

This cell now has more than a hundred small farmers within the taluka and others in equal number from rest of the State.

Only eight years ago (in 1974) this was a nucleus of some twenty participants of different educational competence and staying in different parts of the State, but linked by the new network system of learning exchanges.

The group has by now imbibed the spirit of self experimentation, analysis and techniques of result standardisation.

Our first breakthrough
in grape revolution in 1967.
Seventeen bunches
to one cane only.





Our first participatory grape cell
- representing people from
all walks of life.

By this they have revolutionised the whole technique of grape cultivation in our state (spacing, training, thinning, girdling auxin treatment, fruit preserving techniques etc.).

See Appendix Two

In many of these fields, their experience, their results and their own research is now found superior to any of the agricultural universities in the state or even with the results of the National Research Institute in Horticulture at Pusa, New Delhi. The old technique of grape plantation has given way to the new techniques of this cell. This cell has now become a sort of self styled alma mater to whosoever is interested in whatsoever field of grape cultivation. This cell is now the leading grape producer in India and is fetching the highest price in the Bombay, Delhi and the international markets. The yields of their vines have also surpassed previous records. Now some post-graduate students in agricultural universities are taking research projects on grape in association with this cell. This brief story of the experimentally involved grape cell is a clear demonstration of the practical effectiveness of the approach so far discussed.

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Chapter 3 :

Knowledge Networks for Every Person

- 3.1 Venture & its vehicle
- 3.2 Beaming : the process of making the venture known
- 3.3 Stimulus and Response
- 3.4 Feedback
- 3.5 Fusing
- 3.6 Belonging : Togetherness in experiments or Prayog Pariwar
- 3.7 Collaboration
- 3.8 Mutual Enhancement - the talent interpolation relationship
- 3.9 Information Exchange - Bank directory
- 3.10 The Post box number - method
- 3.11 The Directory System
- 3.12 The Activity Bank
- 3.13 Recapitulation.

.....

Definition of Terms :

Let us now begin by scanning and analysing the process of weaving of this “Experimentally Involved Net-Work” (We will denote this as E.I. network or E.I.Cell). Various new terms and catch-words are needed while explaining this complex process. The terms Venture, Beaming, Priming, Feedback, Experimental Involvement, the “CELL” have special connotations and contents and therefore need some elucidation.

The methods such as collaboration, talent interpolation, card set evolution, the post box number, the directory method and telephone exchange schemes and the activity bank method etc. are also gradually getting well formulated and established. To get an insight in these factors, let us take all of these serially so as to explain and illustrate them for additional scrutiny and critical comments.

Readers participation in enlarging the content and use of these terms is invited.

3.1 Venture & its vehicle :

Venture :

Any experience, information or experiment that is capable of dealing successfully with any particular real life situation can be termed in brief as a venture. Thus every venture must have :

1. Some real life situation to deal with, and
2. Someone's first hand experience or experimental information to deal with the problem successfully.

Venture = Real life situation + Scientific know-how creates calculated risk taking capacity.

This criteria helps us to frame suitable ventures fitting to different real life situations.

Such ventures have, further, the following characteristics:

1. Every venture always contains an element of calculated risk.

Illustration - For a venture for poultry rearing in a house, the real life situation in the house of the poor in villages is entirely different from that of a well employed man having his house in the city. The calculated risk levels for the city man will not be the same as the villager. The city man would not like the birds kept free in the house but will require some sort of a cage to keep the birds. But, the poor villager, on the other hand will like the birds free, on the available free space that surrounds his house. The city man will be able to purchase ready made poultry mash as a feed but the villager will be only ready to depend on the wastes available free to him in his family situation to build up good quality mash out of it. Thus, the idea of rearing larvae as a grower mash to the poultry, on the available animal wastes and leaves, becomes an element of calculated risk, fitting to the poor man's real life situations.

Similarly, while fighting against recurring attacks of cold and throat infections, it is found that many middle class and sophisticated persons gladly risk taking home-made remedies, (such as the use of ginger powder decoctions, garlic vapour inhalation, etc.) when they come across someone who has got success in fighting this trouble himself or with some close family members.

2. Every venture helps to stimulate various forms of adequacies residing in the individual.

This enables every one to discover the others who are going to help them in the learning exchange while realising one's goal.

Note that there is no previous learning bar or pre-requisite; No geographical location bar, no age or sex bar or economic or social status bar implicit or inherent in the structure of the venture. It is a free trust in the natural adequacies in man.

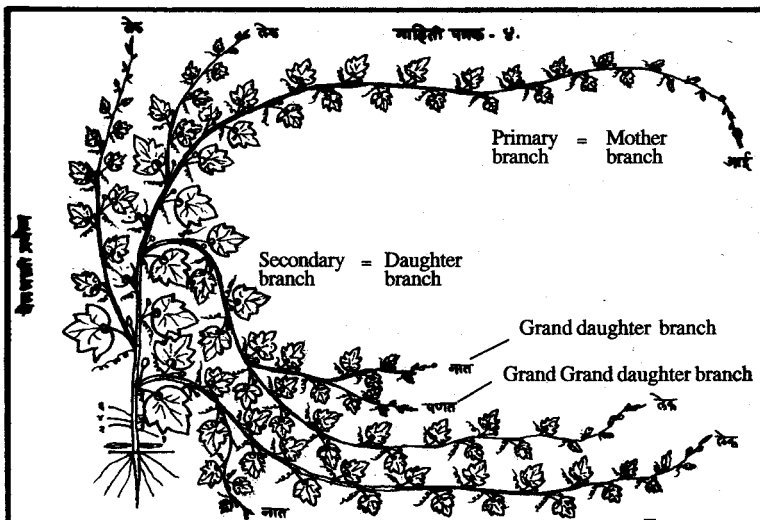
Generally education is given to remove one's inadequacies but venture starts with adequacies and builds them further.

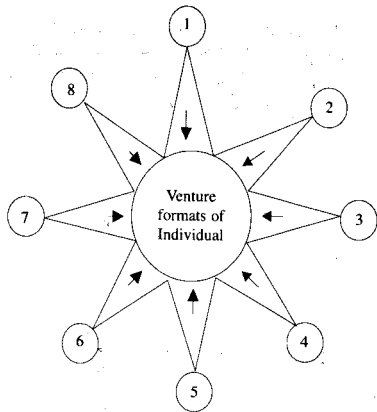
3. Every venture has some scientific principle or contains knowledge information.

But it is never handed over ready made to any one. It is to be rediscovered everytime, by the venturer in his own situation. He has to grasp it and communicate in his own language form or idiom. Every venture thus always allows free scope for the initiative, resourcefulness, imagination, creative hobbies, and constructive attitudes of all the participants at their levels of participation. There is nowhere the danger of ritual initiation or routine course study or system reproduction in it.

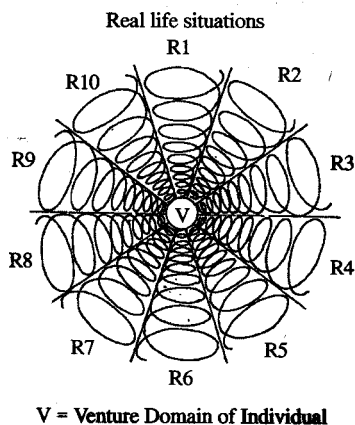
Illustration : In the grape cells, the common idiom for technical terms, such as primary branch, Secondary branch, etc. become the mother branch, the daughter branch.

Every venture builds its own language of knowledge and communication fitting to one's idioms and thus a vocabulary of new words emerges.





1. Urge for better expression.
2. Calculated Risks
3. Scientific Briefing
4. Talent Interpolation & Credit
5. Education through actual involvement
6. Feedback through Networking
7. New Techniracy
- Wealth Generation & Self Employment



And this relationship discovery by the participants while understanding the training structure of grape plants, makes the communication of learning exchange more clear, vivid and direct to all the participants who later join to establish their own grape cultivation.

4. Every venture when realised has a capacity to re-define the existing form of real life situation of the venturer in a new manner.

This qualitative change in one's odd life situations helps to build in him added confidence and hope, while fulfilling his needs. He thus goes on accumulating added adequacies with him on his own. In other words, this means creating self-employment in one's own field of liking.

5. As the functioning of a venture is always in the network of learning exchange, a new trust in knowledge utilisation and the methods of experimentation is built up amongst the participants.

It also creates a further desire to share and care for each other's experiences, aspirations and limitations.

6. Every venture has an inherent potential to go on budding by chain reaction.

This is so because in venture realisation each one is an explorer and a discoverer in his real life situation. (Thus in our experimentally involved grape cell various ventures in training of vines led to new ventures in the spacing of vines and those again led to ventures of root study of grapes, which again led to new soil structure building ventures and so forth.

3.2 Beaming : the process of making the venture known.

It can happen in a variety of ways and by the use of all communication agencies except advertisement agencies. In my first experiment the “Kirloskar” magazine did this job of very wide beaming.

Just as in radio transmission system, programmes at various frequency meter band are beamed out and are reproduced on only those receivers tuned to those meter bands, so also every venture has a particular allotted meter band, the Real Life situation in which it has become successful. So venturers from correspondingly similar life situations alone begin responding, while for persons in different life situations the same venture remains ineffective in making them respond like the other persons. Thus the picking of the venture signals is in a sense band specific (the band being a matching real life situation) in which the first venturer has earned promising results.

It is generally found that when someone is full of some exciting concrete achievement, he himself is the “radiator” of his work through his talk or indirect references that he makes. Many a times persons who know of his success go on beaming the venture. But now a special directory method is introduced in the network system. (See directory method). This method has a great potential to make such beaming a real success in a perfectly non-personal manner.

The process of beaming eliminates the need of any ritual initiation for the participant as it is only an open invitation for sharing one’s venture. It is an open invitation (given particularly) in the field of choiceless awareness of similarly situated persons to feel for their adequacies in the venture and to join it for any range of free involvements.

The new progress in informatics in the last ten years has increased the scope of this process of beaming phenomenally.

Some such sample studies are now available.

With the latest modes of computer communication via Internet & Electronic Bulletin Boards, this becomes even easier.

Illustration : At present more than hundred ventures are beamed by the network in grape culture, but a participant who joins soon shows preference to only the one best suited to his situation.

3.3 Stimulus & Response :

Priming : Priming comes after the process of beaming. With priming one becomes intensely aware of the adequacies one has in dealing with his real life situations. He begins to make his preferential choice toward the venture. This builds in him the restlessness that impels him to get learning exchange with those who can share with him for getting his need realised.

Critical Remark : Priming does not mean enrolment in the venture. It is only the first indication of one's desire to join and work together. Priming provides a situation to explore further and to see if the venture is simply a fascination, an infatuation, or of real interest to him. This we may call "dating with the venture".

3.4 Feedback :

The term feedback does not mean simply getting help and then reporting back. This term has its origin in modern technological device built to control a system on its own. Thus if the electric current or the noise in a machine goes above a certain level then the device generates a situation that gives a feedback in the machine and the anomaly is automatically checked and brought to the normal. Even in the biological process of plant - growth we can observe the same phenomenon. Though the tip is growing further ahead, all the buds in the parts under the tip become dormant because of the inhibiting of the hormones created in the tip. If the tip for some reason is broken this inhibition stops and latent buds at the tip begin to grow.

See Appendix
Open University Systems

P.P. as an invisible
Open University.

Thus the plant can preserve its own structure without having unhampered growth in all directions and competing with the system in itself. Moreover these hormones stimulate root-growth, which in turn, produces another hormone-cytokinin that stimulates new bud growth. Thus the feedback gets established among the buds and roots.

In the venture network of learning, both the participants and contributors react by the process of feed back only. Thus the contributor can neither go on filling the participant with undue information nor the participant can remain passive in his venture to draw upon the contributor only. If it becomes so, the process fuses and the danger of preserving a false learning situation automatically gets eliminated.

3.5 Fusing :

Generally, the first few learning exchanges are exploratory on both sides. In these exchanges the participant comes to realise that the venture which he had supposed to fit to his real life situation, is not really of that type. The contributor also may become aware that his information, data and experiences relating to that venture in respect to the participants is very insufficient and thus the involvement automatically comes to an end.

If however feedback continues after this exploratory stage a new experimental involvement begins to crop up from among the participants and a new relationship called experimentally involved cell (E.I.Cell) begins to flourish.

Illustration : In my first working with grape ventures I found that some participants wanted to have information on rooted grape vines while my venture was dependent only on supply of simple cutting of the grapes. So many participants fused as they could not get rooted cuttings in their neighbourhoods.

Similar categories of participants can be of the types who Use, Refuse, Confuse, Diffuse, Effuse and who share in the Ventures in either of these categories.

But this motivated me to perfect the way of sending rooted cuttings over long distance by post, to resolve the problem so revealed.

Thus the process of feedback helped both ways. When someone fuses it gives a new stimulus to work on new real life situations to make the venture a success in those situations also. If the feedback continues it develops E.I. cell to further learning exchanges.

3.6 Belonging : Togetherness in Experiments :

or PRAYOG PARIWAR (P.P.) :

This process builds non-institutional non-system (non-establishment) type of networks, where the cells are the node points.

The continued feedback in the network of learning exchanges gradually begins to generate a new cell activity. As the participants begin to interact and get involved, they begin to relate new facts, or modify old observations, contribute new approaches and so forth. Thus a new type of E.I. becomes operative. Many new

Assurance levels (educational inputs),

Insurance levels (protection for risk inputs) &

Credit levels (help or goodwill inputs)

begin growing from within. Thus the emphasis on sharing one another's experience and information increases. This develops a sense of belonging and togetherness. Just as millions of complex molecules, such as enzymes, the protein complexes, the hexose groups, the trace elements in any living cell are operative, in the same fashion, this network begins to operate. When this stage is reached we say that the network of learning exchange has matured into a cell activity.

Illustration : In the early stage when the grape cell was just only a network of learning exchanges, it had very little of its own venture potential, but gradually various new venturers began to grow by the process of chain reaction and many new ventures joined it.

The success in these ventures created a permanent involvement cell bond among the participants, as

1. all the knowledge inputs,
2. insurance inputs, and
3. credit inputs

were freely available to who-so-ever small or great, expert or lay-man, new comer or old member. This grape cell has now with it, the best knowledge, proven experience and credit inputs, that even big agricultural universities or horticultural research institutes may not be in a position to provide. This cell has now become the alpha and omega of grape cultivation.

Together with the above explained terms in the network, there are many other relationships and forms of working such as methods of collaboration, talent interpolation, post box number, telephone exchange, activity bank and so forth. There are also some special systems such as directory system and card set system working in the cell. Let us further study these in brief.

3.7 Collaboration :

The word collaboration implies that it is a temporary bond of a timely help to cover any unexpected difficulty. It is not a constant commitment or a common membership bond as is found amongst the members of the cooperatives. Thus there is no vested interest operative amongst the cell members. It is just helping one another at the time of one's needs. In a manner, it is just like helping each other when we have to cross a difficult stream that comes in our way. In such situations one stands on the side of the river, while the other holds his hand and enters the current of the stream. With this help he then gets hold of a place and now helps the first man to go a step ahead of him and get his feet rooted in a new situation in the current. This constant interchange of relationship and responsibility helps them both to overcome the difficulty in the way.

Spontaneous growth of collaboration is the essence of the success of the ventures generated from within.

They were free to go on independently on their own before the need was encountered and again after the need was got over. Relaying in mountaineering is one more example of this collaboration with one another.

This method of collaboration thus creates temporary mutual relationship amongst cell members, while taking additional involvements in the venture and not a constant commitment towards the success of the experiment. This prevents the cell activity from getting over ordered and preserves the individual freedom of sharing and caring to the fullest. No vested interests can thus spoil the cell working.

3.8 Mutual Enhancement :

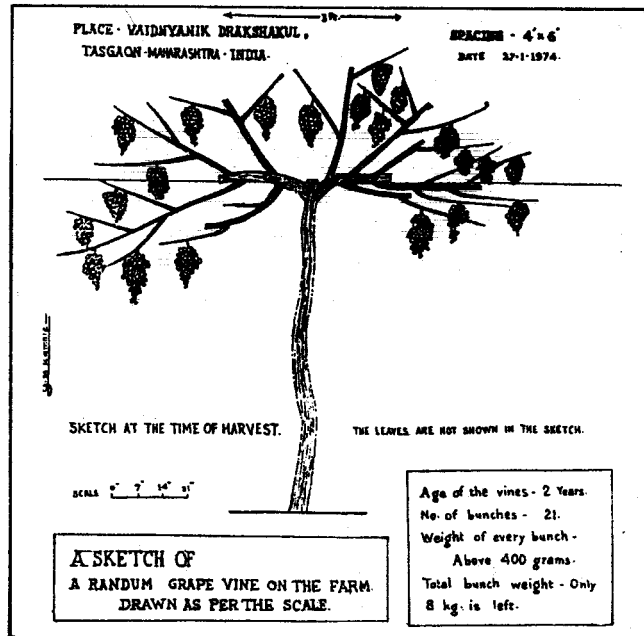
The Talent Interpolation Relationship :

This relationship means creating from within the necessary assurance levels (educational inputs), insurance levels (or risk covering inputs) and credit levels (help inputs or good will provision). These are made available to one another in a free manner by interpolating each other's potentialities in these fields. Thus there is no constant teacher-student relationship in the cell. One who is a receiver at one stage may become the contributor at the next stage. Thus whatever type of minimum learning information exists at whatever place in the network of exchange it becomes available spontaneously on its own.

This process further helps in spotting the "seers and the peers" in the exchange communication and helping them to join by filling any type of gaps that may emerge in their working together.

Illustration : Some one from our grape cell provided canes as a planting material; another tried to develop a method of sending rooted cuttings by post without any special additional charge.

The necessary scientific know -
how to build up ventures in
different real life situations is
possible because of this unique
process of spotting the talents &
then interpolating them in the
network.



A grape vine from one of the Tasgaon farms.

Such assured record yields from each vine build up sixteen tons of quality grape produce in one acre of land and that too from the very next year of grape plantation.

Someone else gave a pictorial observation of this growth, while someone had the same growth sketched to the scale.

Someone built up the relationship between the leaf area and the yield, while some other member made the root study available.

Thus many types of assurance, insurance and credit involvements were interpolated from the group itself. These saved cash costs in the venture realisation and helped to build up confidence amongst the venturers.

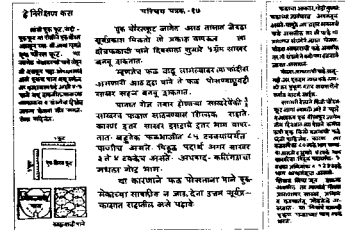
39 Information Exchange Bank Dictionary

The Card System : All the knowledge inputs, the risk inputs and credit inputs used by the cell members in their real life situation to make the venture a success, gradually emerge as new information and action units in the card system.

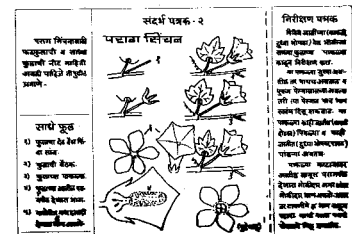
So he is free to circulate what he knows, not in a bound book form, but as a unit of beaming device for getting cross tallies for his new ventures.

Illustration : Suppose there are ten cards in a card set on grape growing techniques suitable to veranda grape garden. On the back side of these cards there will be given other ventures that would be stimulating to many who might not be interested in the grape growing techniques, but techniques of rose growing, getting good radishes for daily use in a small pot, new aggregate techniques to make soil fertile by using local resources etc. or ventures in keeping old age away by using wheat grass methods, or ventures to get good normal supply of enzymes and vitamins by using crushed-raw-germinating seeds etc. The publication cost is shared by the venturers themselves. Their own results are thus not put to the screening or editing by a third party who is not an active participant in the venture. This method increases the freedom of all sorts of communication and interaction among the innovative venturers. The freedom of expression, the freedom of sharing knowledge with others must be the real motto of the free press in a democracy. But with limited space available in newspapers, unfortunately, they find it extremely difficult to do full justice to each and every innovative contribution. The P.P. method of sharing the publishing costs, thus eliminates these constraints.

Various booklets, manuals and short, low cost publications are now available.



See Appendix for an example of current card exchanges.



3.10 The Post Box Number Method :

This is a single device to make the working of the cell non-personal and of eliminating any danger of ritual initiation in the involvement format of the cell. All the correspondence is made against nicknames and under the address of nearby friends instead of their own.

One can also use as many nicknames and addresses as one wants. So the whole system rapidly dilutes into a non personal form. By this way the correspondence begins to take a more free form as the amateur never feels shy or over enthusiastic while developing communication with the talent of some big person of position and social status. There is another important advantage of this system. Your spontaneous original work is many a times exposed to danger of attack from the vested groups. Many a times the experts in the field also feel embarrassed or exposed because of your superior results.

Illustration : Our grape cell developed new methods of spacing the plants as against the traditional ones. This helped to increase their yields. Now vested group might have created a situation by writing a few articles on the pretext of critical observation, that this method was going to suffer in the near future because of close planting of vines.

Even the traditional experts would have had to credit and substantiate their statement by further remarks but as the whole activity was non personal and scattered in a perfectly random way, they could not attack the system without making a total critical analysis of the entire outlook. And this analysis would have proved the superiority of our ways because these had been established and tested in each one's real life situation and not in the form of a commercial proposition of the vested groups.

We have now developed various tests to identify the intensity of participation.

Critical Remarks : It is not still very clear to us as to what extent, in the network of knowledge communication, the identity of the participant must be preserved. Thus at a certain stage of the involvement the desire to get personally introduced with the talent or the seers or the peers with one another and with those of their own category becomes urgent.

Moreover, there is nothing wrong in taking the total responsibility for one's own ventures at any stage of its growth. So some method to equate this identity clearly in spite of one's posing by different names, must be established. One must not get a chance to shirk his responsibility to adverse effects, if any, of the correspondence.

3.11 The Directory System :

The directory is a device that helps the process of beaming and cross communication. We are still working on this system. There is a great scope for many to contribute to this design. To make the process clear let us describe it in full.

Readers views and suggestions are invited on this topic.

We have found that any code number of seven or eight digits will be enough to maintain a free ready reference with all for any type of desired learning exchange.

Thus in the grape cell activity there are various levels of real life situations that can be classified in ten groups.

1. with veranda space to grow grapes
2. with kitchen garden and meagre resources.
3. with small farm but no resources.
4. with a good farm but adverse climate etc.

All these numbers can further be suffixed to make them more systematic. Thus the digit in the units place will be relating to a real life situation. Thus number 24 means - two for kitchen gardening and four for less water for two months in a year. The suffix 4 thus helps to denote how the group 2 is further qualified. The meaning of each of these digits will be given on a separate page elsewhere in the directory. Next number in the tens place will denote credit unit situation, say (2)64 is this number (thus one may need maximum credit or minimum credit units in making the resources for grape cultivation available).

Suppose number 6 in this place speaks (from corresponding reference list) of non availability of fertilisers in the locality, then a credit to get over that difficulty will arise when he will be venturing in the cell.

Now the number (2)64 can be easily read as these ventures where the provision of fertiliser could be had to the participants of kitchen gardeners who in their locality have to face water problem in summer.

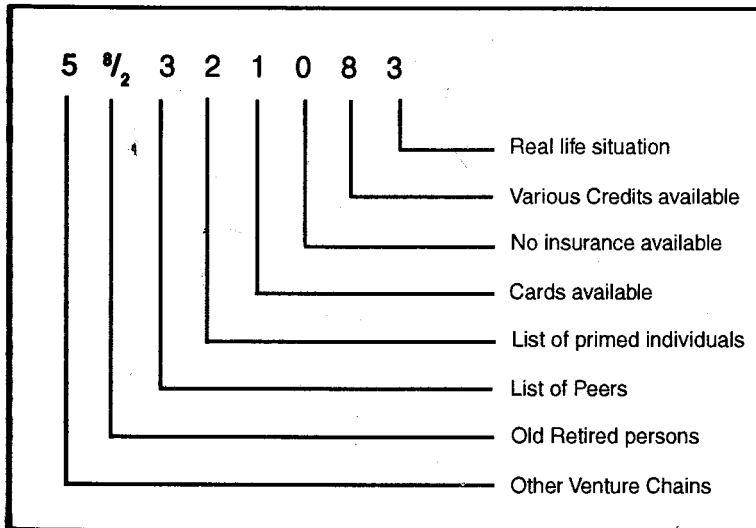
We are now trying to computerise this scheme and the data.

When we once follow this technique the working of the following scheme will be quite simple to follow :-

- | | |
|----------------------------------|-----------------------------------|
| 1. Real life situation | Number in units place. |
| 2. Credit inputs | Number in tens place. |
| 3. Insurance inputs place | Number in the hundreds |
| 4. Card sets | Number in thousands place |
| 5. The list of primed individual | Number in ten thousands place |
| 6. The list of peers | Number in hundred thousands place |
| 7. The list of talents & seers. | Number in the millionth place |
| 8. The other venture chains | Number in ten millionth place |
- grow out of the first chain.

Thus No. $5^{8/2}321083$ can be read as follows.

The number one in the thousands place denotes that some cards sets are available. Number zero is in the hundreds place means no insurance input is available, but number eight in tens place means various credit units are available almost to all types of participants, the number eight in the millionth place means availability of seers of high capacity, and talent who are ready to share their talent with others as the suffix two in $^{8/2}$ means this is the category of old retired persons.



Directory System

This abbreviated system of information for learning exchanges evolved in the course of Prayog Pariwar's growth. It has proved efficient and economical in the pre-computer period. It can complement the present computerised information handling systems, and can also offer an outline for designing new formats.

Thus this post box cum directory number could make the choice system work as a telephone exchange system helping one another to build up direct communication in place of any institutional form of communication in a cell. Moreover as this is voluntary collaboration, no problem of paying or charging fees also arises.

3.12 The Activity Bank:

By this process every one in the participation network goes on accumulating credits that he earns through his involvement in the cell.

The network of learning exchanges goes on spotting the seers and peers in the cell and in so doing the manner of ones sharing, or the desire to extend one's goodwill for other persons to provide him with some basic help, gets credited by the one who makes use of these exchanges. The account of A's work in the activity Bank rests with the participants B, C, D etc. and by contacting these participants by telephone exchange method in any random manner any one can get a check up about whether what he feels of A is of the same order in the account books of others.

Activity Bank is a new form of trusteeship in experiments. The new measures are knowledge units shared, invested, the risk units shared etc. the new energy inputs in ecosystems added etc.

Illustration : One of the talents in the grape cell was discovered by the combined appreciation of the participants located at different places. In fact the talent had not worked on more than five or six of the vines in his garden.

But his observations and the analysis of his observations were of such competence that his experiments helped the other grape cell members with the much needed learning exchange. The fun of it was that the person himself was not knowing in the beginning that his hobby study had such depth and application in realising any type of grape ventures.

On the other hand the knowledge of the so-called successful, big grape gardener in the actual field of working was found to be of not much use to any one in the cell. Thus he got exposed and the cell saved a lot by avoiding misguidance from his so called experience and information in the field. That also made the big gardener understand that he was successful as a commercial grape gardener because of his capital assets and not due to his expertise in the subject.

The whole process of Activity Bank is still in the making, yet it helps in evaluating and avoiding the pitfalls of dynamic cell activity in an internal way. It operates by helping to spot the real seers and peers in the network. It also helps in rejecting the so-called false ambitious persons by exposing them. The other functions may be summarised as :-

More contribution from the readers on these & other points is awaited.

1. The Activity Bank tries to maintain administration of things and services in place of cash. It also helps to expose any false desire of advertisement and aggrandisement.
2. It serves as a link between various agents of development.

3. It creates, accumulates, enters and expands new credit in the cell.
4. It provides insurance facilities for the individuals who need it.
5. It tries to assess the need, the place, the worth of every operation involved in the venture cell. It tries to make the network of learning exchange more practical, more appealing more interesting, more human and therefore more convivial.
6. It helps to take new surveys in real life situations to exploit the latest possibilities which are not so clear at the beginning of the cell involvement.
7. It makes the whole network of learning exchange a common enterprise to all concerned.

3.13 Recapitulation :

Let us now sum up this analysis. We have seen that one can decide on one's own, what one wants to learn how and how much and where learning becomes the function of one's living. One begins learning when one feels that with one's own adequacies one can deal with any problems in one's real life situations. People are capable of learning at all the times throughout life by sharing experience, information, and ventures with others.

In the network of learning exchange no one's knowledge is superior to anyone else's. The name of such a network is Prayog Pariwar or the "E.I. Cell". Various venture formats give birth to these E.I. cells. Generally these techno-scientific ventures originate on their own or are sometimes specially designed to meet the challenges in different real life situations (health, education, old age, married life, social change, youth activities, child rearing, occupational problems in agriculture, industry or service etc.) There are some very clear criteria for evaluating any venture.

✎ This is your personal space to put your observations.

✍ Notes :

These venture spark the latent choiceless awareness and imagination in the field. This then makes one conscious of one's own adequacies, strengths and potentials to improve upon ones existing adverse and hostile milieu.

The process of Beaming or free lobbying later creates new involvements between the seers and peers in the field. The process thus becomes not only the process of working for the people but in a very genuine sense working with the people with the best experience at hand at any moment. The slogan of such involvement cell is "Amateurs must be protected". All these E.I. cells thus go on budding, growing, differentiating, maturing and propagating on their own, by the new processes of Beaming, Priming, Feedback, Talent Interpolation, Collaboration and Chain Reaction. Thus all these cells are self-preserving, self-perpetuating and self-evolving, that is, qualitatively developing and maturing activities.

Every venture involves some elements of calculated risk. These risk units later help to frame the system of card sets for use amongst the cell members. The necessary specific assurance levels (educational inputs), insurance levels (risk inputs) credit levels (help inputs) are internally built up and provided. The emphasis is not only on interest match but also on genuine natural involvements very akin to the family type or organic type of involvements.

In networking there is no teaching process, but meeting of the minds. It is not capability building, but capability sharing.

Thus the feedback between the peers and seers in the field provides the necessary free experimental collaborations. This helps in initiating and building up achievement motivation in the entire experimental network.

Such common sharing and caring in the venture network later builds up a new viable E.I. Cell activity. Thus there is no superstructure or deceptive hierarchy. The entire operation of the web is by the process of Activity Bank and a post box-cum-Telephone Exchange Directory system.

These help to provide all the necessary talent interpolation, collaboration and feed back at every stage of growth, and in a perfectly decentralised manner. There is no hidden curriculum.

✎ You may rank on a scale of 1 to 5, the contents in these paragraphs, 1 being top rank and 5 the last rank.

This genuine understanding between the inspired intellectual elites and the enlightened talents in the field, generates new goodwill and sanction to create sufficient internal credit for the process of building from below.

The cell discovers its own experts, its own talents. It builds up its own faculties, studies, means of communication reference schemes and defines its own standards and further orientations. It develops its own library and laboratory arrangements and discovers its own language of techno-scientific communications, fitting to its own level of idiom and expression forms, basic understanding capacities and needs. At one end it strives for developing new research and new techniques in the field while at the other end it succeeds in standardising new means of generation of real wealth and well-being. It then tries to dissipate real enlightenment, hope and confidence in the surrounding area to further initiate new ventures. It not only embraces who-so-ever desires to get newly assimilated in the already established cell activity but also fosters new activities symbiotically.

Each cell thus gradually emerges as the nucleus of creative existence and expression. It becomes a new dynamic pattern enfolding various vital sets and subsets in the related sphere of real life situations (existence). Within a span of two or three years it becomes a sort of its own alma mater by this process of self- experimentation, exploration and learning exchange. Thus, learning, living and working begin to get permanently inter-connected, as these cells have their real anchorage in creative self-expression, in self-experimentation, in self-education and in self-employment.

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Chapter 4 :

Science for Rural Development

- 4.1 Neighbourhood Ecology : Chickens & Papaya
- 4.2 Biomass & Sun
- 4.3 Pooling the grey-cells & working hands
- 4.4 Education for total life
- 4.5 De-mystification of Science
- 4.6 Alternative, creative reality
- 4.7 Alien Science-Alienated Minds

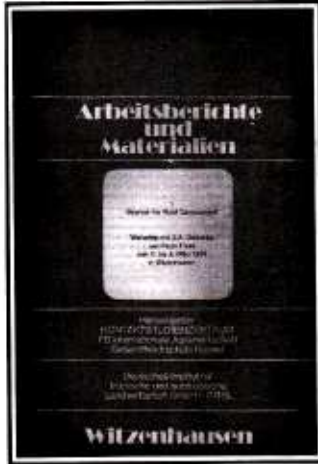
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Following ideas were first presented in the keynote address given in an International Seminar on "Science for Rural Development," attended by both S.A. Dabholkar and Paulo Freire in March 1978 in Witzenhausen Kassel University, West Germany.



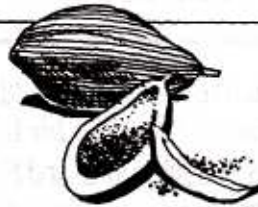
4.1 Neighbourhood Ecology : Chickens & Papaya

While I was still working as a professor of Mathematics, I decided to identify myself with the last man in the field; I worked on various alternative designs, and gradually began to realize that by demystifying science it is possible for us to build up a neighbourhood ecology that can change the picture of the human society and perhaps explode the myth of hunger e.g. I found that in propagating the poultry programme in rural areas, government functionaries geared this programme to the feed mash.



Full report of the conference in the original format in German and English is available. (116 pages)

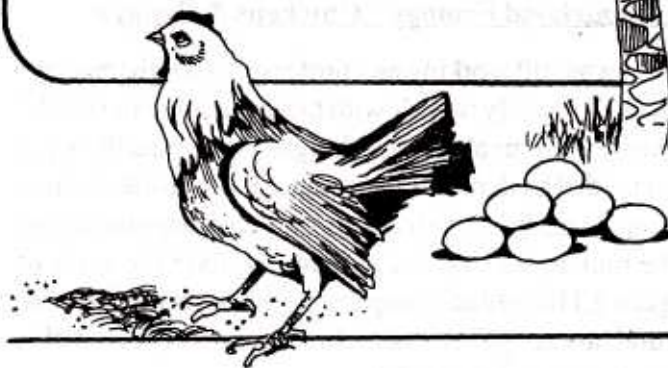
Chickens & Papaya



Papaya seeds contain oily substances and proteins, the fruit contains sugar and pithy substance, and the peel contains vitamins.

A fully grown papaya fruit can be grated and fed to chickens as feed. Daily 120 gms. of grated papaya is adequate feed for one chicken. Thus we can avoid buying any ready chicken-feed.

The fruits produced in an year from one papaya tree, can support four hens and provide eggs.



Which they had to sell, by saying : “Only if you take this mash you will have good results” and by trying to manipulate farmers into buying expensive foodstuff. I then started to build up different models using scientific principles, but trying to implement them in the village neighbourhood.

I asked myself : What is the content of the chicken mash? Can it be made from what is available in the village neighbourhood which will permit me to rear chicken without dependence on the market for mash ? I found that the mash, on which the poultry has to be fed, must have some rich protein, some good carbohydrates, some oil content, some calcium, and phosphorus, so that the birds can produce according to their laying capacity. Looking around I found in most village gardens, papaya trees producing 60 to 80 fruits, more fruits than were needed for human consumption. Chicken used to relish these surplus fruits. Comparing the nutrient content tables, I found that the whole papaya fruit including the seeds, had sufficient nutrients, and minerals to permit good egg production, not necessarily only with western poultry breeds, but by using local poultry breeds too. I found that this type of chicken-feed can be grown near any village house, without difficulty.

This is an example of demystification of science in a real life situation, fitting to the adequacy of the rural man, where he can be confident to get his own mash, within his own resource, and at no cost. Later I found out that instead of papaya we could use the local vegetable called “elephant foot” as reserve food. In India we have some good crop of elephant foot in the monsoon season. We can preserve it for the whole year. It contains again high amount of starch, calcium, and phosphorus, but it must be supplemented with some protein.

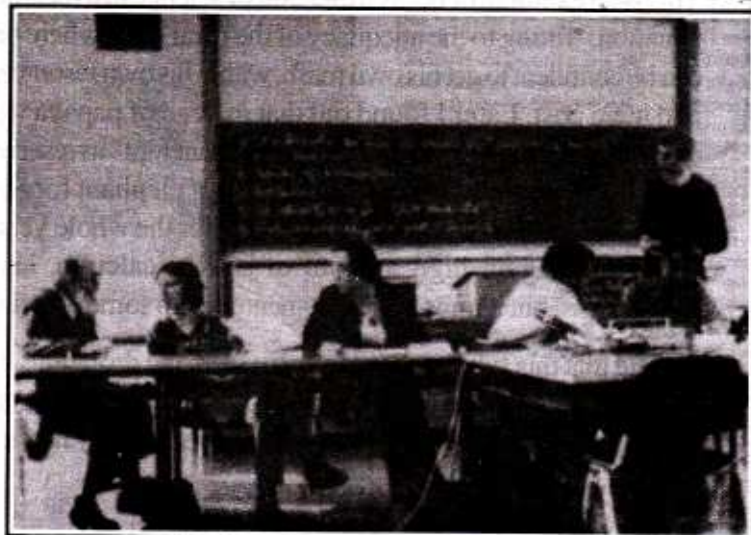
I found that this supplement can come from the droppings of the birds themselves to which could be added some green leaves, some fishmeal, and we can rear abundant fly larvae.

Many other alternative ventures on poultry rearing and dairy science are available.

This larva protein mixed with the elephant foot (mulberry leaves are also an alternative substitute) for fly larvae will provide us an adequate chicken-food. So I gathered that appropriate alternative chicken-food can be found if I analyse the scientific principle behind the mash and do not concentrate on egg production alone. This alternative chicken-food was depending on neighbourhood ecology by using science, demystified science, in a new way to solve the problem at hand.

The second very interesting illustration I can give comes from a dairy project at which some of my friends in India keep high milk yielding cows. Now it is propagated in the market that farmers should feed high yielding cows, some tablets that would enable the cows to give an increase of 1 or 2 litters of milk a day. In the pamphlet which accompanied the tablets substances like butyrates, acetates, and some volatile essential oils were given as the effective contents, but I could detect that the tablets had a similarity in smell with the local red pumpkins. On analysing the pumpkin I found that this product of neighbourhood ecology could supply some similar substances as the tablets and could as well build up the milk return of high yielding cows. This substitute worked well.

The conference
Witzenhausen Kassel university



4.2 Bio-Mass & Sun :

Gradually I began to understand that if we can conserve solar energy through certain biomass, and build up a bio-dynamic model that will recycle most energy inputs that we can draw from the sun, most of the reserves that we need for our neighbourhood ecology building can be made available immediately. Now, being a student of Mathematics, I used to work with quantifications, saying this much result from this much, and this only, and if it fails some principle of science is not as yet discovered.

Detail discussion will follow in chapters 5 to 6 in this book.

So I started on a piece of waste land, similar to the land of our poor farmers. On the waste land I allowed to grow whatever natural vegetation could stand the drought conditions there. Then I introduced goats. Goats relish a variety of waste land plants - a mixed hardy plant flora. With this, in one year I got enough goat-milk and also thirty kg. of flesh of the two lambs, reared on these wasteland products. Then I began to reflect from where the goat had obtained the molecules for making all the bones, all the flesh, all the milk ? It was all from the wasteland developed ecology; then the question arose why not take the things given by the wasteland plants straight as plant fertilisers ? So I picked the growing buds of plants for their relatively high phosphorus content, mature leaves for their relatively high nitrogen content, mature old dried leaves for their potash and calcium content when burnt and the trace elements from different weeds growing nearby. In this manner it is possible to draw on certain latent resource potential following the principle of building from within and from below and not depend on external factors.

Barest Minimum at Barest Space & Input :

Then I took to nutrition problems. I asked myself, what things must I produce first for the common man that will be really essential for him and which he can have in a very limited space and with the ecological inputs he can bank on these in his neighbourhood.

I found the most important things are the spices, garlic, ginger, cardamom, turmeric etc. that provide us with the trace elements and the other essentials for good health. These spices can be grown in small units, and they can be used for the entire year, because these have long shelf-life and need not be consumed immediately. This was my first approach towards the nutrition problem. Garlic for example provides a high concentration of phosphate.

Next I found out in my work that the traditional health and nutrition practises prevalent in Indian culture, worked well in the ecological interplay. Look for example at our custom of eating betelnut-leaf after meals. Scientifically it's a packet of B vitamins, calcium, and trace elements and other nutritional treats.

Or we have the tradition during the monsoon season to eat leaves of the drumstick plant. Monsoon season is the time of respiratory trouble, when a good balance of calcium and potassium is required, for health of the respiratory system and to get this balance the leaves of drumstick can help. Again if you know the scientific principle behind the local health practices, you can look out for alternatives from local resources and use them for your good health, for nutrition dynamics, and for biomass construction.

Interactive, involved, innovative groups in Germany 1978.



4.3 Pooling the Grey-Cells & Working Hands :

I do not work singly, there are many persons who are interested in and attracted to my approach and work; not only people from the common masses, but even from the intellectual groups too. This willingness to start thinking in alternative ways, this willingness to demystify science and use it in a simple way, I now call as the grey matter revolution. (i.e. collaboration, sharing and involvement of the talents, expertise, and other respective human grey matter activities. This grey matter can build up, provide and substantiate various alternative designs and innovations to meet the requirements of neighbourhood real life situations to improve their conditions of existence and living on their own.)

In this grey matter revolution, we try to relate the networking of the grey matter in the neighbourhood to the neighbourhood ecology, in such a manner that whatever scientific principles exist in the community as a whole, can be made available to the common man in his real life situation, and in his everyday needs.

In understanding these scientific principles the common man feels his inadequacies are triggered. Generally, he has the adequacy but lacks the scientific input; real life situation + scientific advanced knowledge input, builds venture. If he now feels, with papaya plants I have a base, and a chance for poultry production then he can built up a venture in this.

In this way people came to me saying, we are interested in nutrition, in solar energy, in grape cultivation, we are interested in sharing what we know with the common man. And now I have several networks while working with intellectual groups in society and relating them to the common man. And in working with these groups I found out that there is always the situation of mutual learning from both sides by sharing.

This contribution of Prayog Pariwar was highly acclaimed in the conference.

Readers observations and comments expected.

4.4 Education for Total Life :

While I really appreciate the point of making education a tool for real change, I feel that it should not be a tool only for political action alone but for the total life action also. As a first step towards this we can build up through some non-formal open system, a non-structured approach of education in the sense that we can make people, who are not in the profession of education carry out the purpose of education.

The first characteristic of our new education will be that it is de-professionalised. And in this manner we will make people understand that there is enough of our own knowledge within the group and/or in the community which we can make open and accessible to all. I have found in our present formal education system too, that most of the true talents realize their talents not in schools, colleges or universities but in their own field of work, right within the community, and we can call their work scientific too. I made these observations in various fields of my work.

For example those who are not professionally acquainted with solar energy problems often achieve more in solving them than the professionals. I could report similar experience from the field of survival agriculture and other fields.

With deprofessionalisation comes AN AWARENESS amongst the people about the specific relationship between the awareness, and the knowledge continuum that we have with us. The knowledge that helps a person to solve, on his own, his problems, in a real life-situation is always needed, respected, and called for. It creates an assurance in a person that he can build up his own **techniracy** (technical literacy), through certain specific science literacy. He can shape, modify, alter and transform his own life situations with his free choice and will, and with his own adequacies by linking the necessary **assurance** (knowledge) and **insurance**

(risk protection) from some deprofessionalised talent in the network cell in a non-structured way. This creates a feeling of belonging and togetherness in a group which we can take as an action cell or work cell. This builds up strength in the common man to stand up on his own and try to build up wealth from within his own resources.

4.5 De-Mystification of Science :

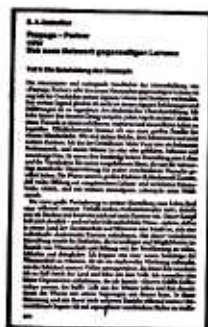
Demystified Science : The liberator

Unless we build up a new economic freedom amongst the poor people on their own strength, they cannot assert themselves against the establishment. Therefore we must find certain non-structured alternative models, and my analysis leads me here to the strategy of demystification of science. If we demystify science and build up neighbourhood ecology that will free the common man from the dependence on the markets, and the labour market, we can build up a **conscientized mind**, a truly self-reliant mind.

With regards to the question often asked on whether there is any possibility for survival agriculture on the wasteland, I feel with the 20th century knowledge of relationships in the biogenic, physical, and other fields, we may safely say this is possible. I call this the experimental truth built up in the community as deprofessionalized demystified knowledge units which make people more self-reliant. And here I want to make a comparison with the time during freedom struggle in India, when Mahatma Gandhi moved the masses in the same manner. He made them realize in 1930 that they had enough strength to take the salt from the sea. This made the people realize : we have our own law - instead of the law of the British government. So it will happen again that we will have the experimental truth in our hand, saying that it is far superior to the agro-science propagated in the field by government and agro-industry.



Full chapter on Prayog Pariwar translated in German by Mr. Heinrich Dauber.



With this new educational tool of open education we will build up some basic experimental truths in the community. There might be a danger of confrontation, but I think with this alternative truth and the traditional truth we will always come to an agreement. Through following Mahatma Gandhi, we can build a positive agreement through mass action, mass movement and direct action to decide what is really good and true. And this will be proved by the system which is more humane and helpfully gainful to the poor.

4.6 Alternative, Creative Reality :

We believe, as we experienced in India, that when we have to change the social and political conditions, we always find creative possibilities as well; and not only the functions of dialectics working in actions and reactions, in thesis, antithesis, and synthesis; as the only possible way. We have a capacity to build up an alternative creative reality of our own. We can say that this is a better alternative and this is a new creative human contribution which, when added to the open educational system, will possibly give a workable solution.

My last point is that this building up will be on an international plane, and not only on a national plane; for the knowledge continuum will be interacting in a network manner.

This progress will be of a better dimension than what we have through our political system and this is important. Besides, we will provide this creative transformation and development from within at a lower cost than what government and the various institutions can afford. With this system we will have a better chance to survive and evolve.

4.7 Alien Science - Alienated Minds

After attaining independence in 1947, most of the Indian educated people thought that by simply imitating some Western development practices they could change the country. With this idea they tried to imitate western development models to move the people. But these alien practices of the educated classes failed to bring real development, real change. However for this it is not the knowledge itself which is to be blamed but the method by which knowledge is given to students and participants. This is true, especially in the field of science. We talk about science, about the importance of it, that we can prove it, but we rarely do it. We rarely use it to introduce the real change that we need. Science will be barren (i.e. unproductive), unless we move in the grey matter zone, unless we experiment at every stage with all available knowledge in the field, to solve our own problems in a scientific way, unless we share our experiences in experimenting with science, with others in the action cells, and in the neighbourhood.

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Chapter 5 :

Natueco Culture : Scientific Agriculture

- 5.1 Some experimental revelations
- 5.2 Historical perspective
- 5.3 The constraints
- 5.4 The clues
- 5.5 Harvesting the Sun
- 5.6 Recycling Process
- 5.7 Energy pool and energy chain

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5.1 Some Experimental Revelations :

On returning from Germany, after my critical exposition on Science for Rural Development in Witzenhausen in 1979, I took early retirement from my teaching job. I then plunged deep as a full time explorer in our search for Science for Rural Development; I became a free lancer to venture again in various fields of life and living.

The news of my retirement soon spread amongst the active experimental grape growers' cells in Maharashtra. Their constant inquisitive inspiring inquiries began to pour in and a new type of spontaneous networking of 1. Involved 2. Interactive 3. Innovative 4. Integrated 5. International 6. Informatics gradually emerged.

This knowledge communication and experimental participation activity took a new swing in the next few years. They urged me to translate into Marathi a world famous resource book on viticulture (above eight hundred pages), consolidated and published by the experts in the university of California. They then organised, on a large scale, monthly and bi-monthly study courses on grapes in four different parts of our state. Usually the strength of these classes was four hundred or above and at times even over twelve hundred. They gathered together to attend these classes from far off places ranging from sixty to hundred kms. Each one of them paid active contribution to share the cost.





Comparison between Natueco-Culture & Natural or Organic Farming is shown in the margins of the next few pages.

Natueco Culture :

1. This is a new concept of farming.

Natural Farming :

1. This is the traditional concept of farming.

They took active part for five hours with only a short break and with full enthusiasm they studied, discussed and took notes on each and every aspect of grape cultivation.

With this spirit of study and experimentation in due course of time the grape growers assured record yields from their farms. On gaining this confidence they established worldwide links with university experts in grapes and horticulture. Many of them even visited Australia, Israel, California and Europe. They studied and compared the cultivation practices abroad with their own. They then made first hand market study in various parts of foreign countries in the Eastern and Western hemisphere of the world. Within a period of six to eight years the grape turnover in Maharashtra crossed the level of Rs. Four hundred crores per year. It firmly established itself as a promising agro - industry.

But along with this all sided progress, the grape growers also tried to earn better added acquaintance with the latest research in plant physiology, in biochemistry, in agronomy, in ecology and related sciences. Simultaneously with their growing zest for new experiments and research, on their farms, to reduce the external inputs in cultivation, a new vision of farming began to dawn in the minds of some of our inquisitive farmers. We aptly named this farming system "**Natueco Culture**". Natueco Culture is **not** "Natural farming" or "Organic farming".

In natural farming, farming is done trusting nature through the empirical wisdom of the ages. In Natueco Culture on the other hand, we do farming by knowing nature more and more and better and better through critical scientific inquiries and experiments. It is an ever growing, novel, unique, participatory tryst between man and nature. Moreover Natueco Culture is in no way related to the present commercial techniques of farming.

5.2 Historical Perspective :

With this vision, **Natueco Culture** and Critical Scientific Agriculture, became synonymous words to us. We realised that the major features of scientific farming were also the basic features of Natueco Culture. Why and how it is so, one can judge from the following account.

It was some time in 1936, the process of photosynthesis was first deciphered. It is now well-known that all agricultural production is mostly due to this process of photosynthesis. Simultaneously various research studies in recent years, of many important crops, have contributed to our in depth understanding of their physiologies. Many volumes of original research findings are available on each of the following : crops like rice, maize, sugarcane, cotton, groundnut, apple, grape, mango, strawberry, papaya, lemon, oranges, pineapple, tomato, Potato and other roots and vegetable crops; rose, gladioli, tulip and other floriculture crops. Fortunately one can have free access to these studies if one so desires. Latest progress in biochemistry and molecular biology and other similar branches in science has helped us to understand the enzyme action and the role of micronutrients in this action, and how various endogenous growth hormones, growth regulators and inhibitors, in plants and animals affect their growth and development.

One can reflect back, how ignorant were we some two hundred years ago, when even the constituents of air (Oxygen, Nitrogen, Carbon dioxide) were unknown to us. Now these constituents are the talk of every school going child. It is the recent knowledge explosion of the last few decades that is giving us better and better insight into nature's methods, devices, manners, and ways of weaving maintaining enhancing, enriching, upgrading (quantitatively and qualitatively) this complex web of eco - system. By Nateuco Culture we mean this vision of enriching and enhancing one's farm and neighborhood ecosystem.

Inadequacy of language

All languages have limitations. The use of words have different connotations and meanings in different contexts.

P.P. is aware of this problem and is trying to evolve the most appropriate, communicative terminology.

Natueco Culture :

2. Farming is done through understanding nature more and more.

Natural Farming :

2. Farming is done through trusting nature as it is.

5.3. The Constraints :

If one is made to understand the constraints under which nature has achieved the miraculous feat of eco-system building and development, one is sure to be stupefied. Nature has to obey and act within the two laws of thermodynamics of it's own making.

The first law of thermodynamics states :

“The sum total of all mass and energy in the system will remain constant”. These can never be created or destroyed. However they may be transformed from one form to another and one type to another. In spite of this external resource crunch found in nature, we find that nature, through its own farming, is having full fledged abundance in its own ecosystem. In Natueco Culture we are going to repeat these processes to create abundant wealth on our farm and in our neighborhood ecosystem. We will discuss how nature has overcome the resource crunch. We will then realise the inherently great carrying potential of our ecosystem, that we have so far failed to develop because of our sheer ignorance of these devices.

Previous to that let us see what **the second law of thermodynamics** states.

This law, as it is known now, is the law of disorder or chaos and is called the law of **entropy**. The implication of this law is that though energy can not be created or destroyed it can be degraded into unavailable heat energy so that no work can be harnessed from it. The term chaos means total loss of inter-relationship. This inter-relationship exists through some form of mutual exchange. Such exchange is nothing but information communication within the system. In other words when this law will fully prevail there will be no organisation and no information communication in the entire systems.

Natueco Culture :

3. It is nature friendly.

Natural Farming :

3. It is nature glorifying.

5.4 The Clues :

In spite of existing within constraints of these two laws of thermodynamics, nature is always endeavoring to express itself more and more by weaving more and more complex networks of information communication in the system that was at one time mostly disorganised. The more the complexity of the organisation, the better is the information communication, and higher is the quality of expression. By nurturing life process on this earth for higher and higher complexity through the process of evolution nature has developed a system which we now call ecosystem and in which man is at the apex of evolution.

What is this life process ? How did it originate ? Why is it evolving ? These are the questions the answers of which are not as yet settled. But we know now well that the energy needed to pump out entropy and to reduce entropy disorder and to build up complex ecosystem comes from the sun. The energy needed for running this ecosystem is harvested by nature from the sun. It is harvested by the green leaves of the biota mostly through the process of photosynthesis though nature had at one time tried other insignificant processes to achieve this in the early phase of the evolution of life.

Through the photosynthetic activity of the entire plant kingdom, sun energy is harvested and conserved and is later invested and used by the other members of the living kingdom through nature's food chain.

Along with harvesting the sun to overcome the resource crunch, nature has established by now various types of cycles such as carbon cycle, nitrogen cycle, soil fertility and plant nutrient cycle, hydraulic cycle etc. There are other cycles too such as seasonal cycles, the daily day-night cycle, life cycles etc.

Refer work on Dissipative structures by Ilya Prigogine.

Natueco Culture :

4. It promises Plenty for All.

Natural Farming :

4. It hopes to establish sustainable development only.

Natueco Culture :

5. It asks for resource right for each family of five.
 - a. Ten guntha (100 M²) Sunlight.
 - b. Daily one meter cube (1000 liters) of water as usable waste water.
 - c. Latest of science unto the last person in a demystified way. It provides a viable scheme for increasing negative entropy in the neighbourhood.

Natural Farming :

5. It is worried of resource crunch in nature. It fails to understand how abundant wealth can be generated for the benefit of all through enrichment & enhancement of neighbourhood resources by increasing negative entropy with the help of living systems.

This cyclic working in various aspects of existence is other major feature of nature's ecosystem.

In due course, while highlighting the future role of mankind in participating with nature for enlarging these horizons in the present ecosystem, we will continue this discourse further. But presently we will concentrate how our new vision of Natueco Culture given us a new perspective for creating enormous prospects for real wealth generation and that too everywhere and for everyone.

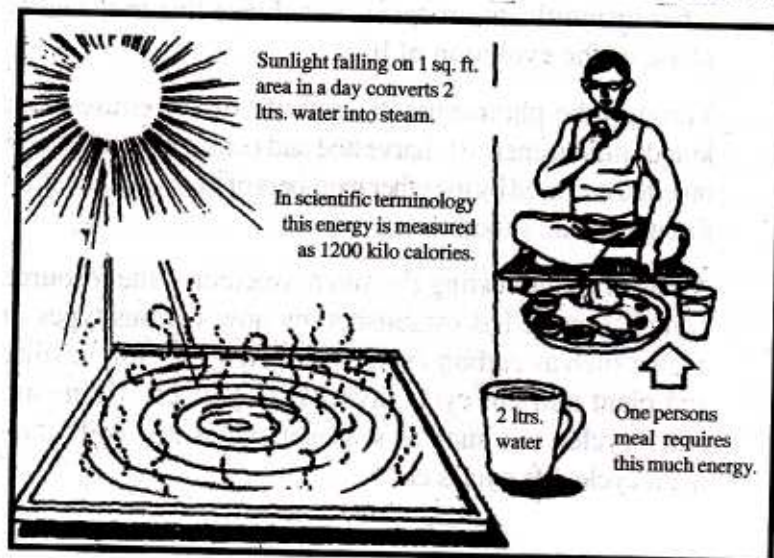
To recapitulate, the major features of Natueco Culture are :

1. Harvesting the sun.
2. Recycling Process.
3. Establishing proper energy pool and energy chain as food chain.

Let us now take these one by one for further critical study.

5.5 Harvesting the Sun :

1. We have seen that nature has built its food chain through evolving the process of photosynthesis to harvest the Sun. But nature is capable of harvesting only a small fraction of direct, total solar insolation.



The Sunlight that reaches our biosphere reaches at the rate of 2 gms Cal. / sq.cms. / min. or 2 K Cal./ sq.ft./min. On square meter basis this comes about 14,400 K cal/day. Moreover the amount actually reaching any place any time on any day depends, on latitude, cloud cover, water vapour, and other gases of the atmosphere and also on the season of the year.

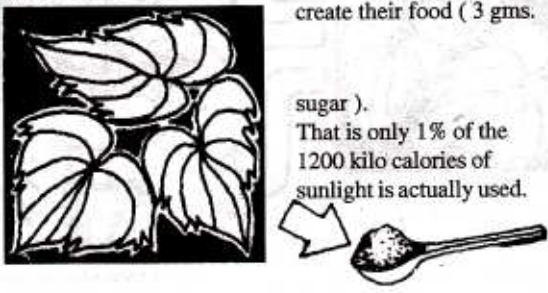
Out of this total solar insolation reaching the biosphere different types of plants harvest different (one to one and half) percent of light per day. C₄ type plants such as sugarcane, maize can harvest more of the insolent sunlight as their process of harvesting sunlight is more efficient than that of the C₃ type plants such as rice and various vegetable crops etc.

Thus the leaves of different plants are seen capable of harvesting only maximum one and half percent or so of the total light energy.

2. The first product of the food chain that green leaves produce is glucose. The green chlorophyll part in the leaves can harvest sunlight which they use, for photolysis of water coming to the leaves through the roots. Then it combines with CO₂ (Carbon dioxide) part of the air reaching the mesophyll zone of the leaves through the stomatic pores.

Daily in one sq.ft. space, in ten hours of sunlight, three grape leaves utilize 12 kilo calories of sunlight to create their food (3 gms. sugar).

That is only 1% of the 1200 kilo calories of sunlight is actually used.



Natueco Culture :

6. It has a new vision of infinite resource potentials in nature (within its first law of Thermodynamics) through increasing the universal human creativity to harvest these.

Natural Farming :

6. It is vary sensitive to disturb the present equilibrium of the system.

Thus one sq.ft of sunlight if harvested daily would provide us, one time meal worth food energy. However leaves can harvest 2% to 3% of the solar energy.

Natueco Culture :

- 7. Depends on critical understanding of greening & recycling of bio-mass from within to enrich the structure & fertility of soil in a calculated way.

Natural Farming :

- 7. Depends on traditional practices of organic farming in an empirical way where mostly organic wastes are brought from out side.

At the end, the first six carbon sugar (glucose) is formed. This glucose is temporarily stored in the leaves as starch. The oxygen produced from water in the process is released in the air.

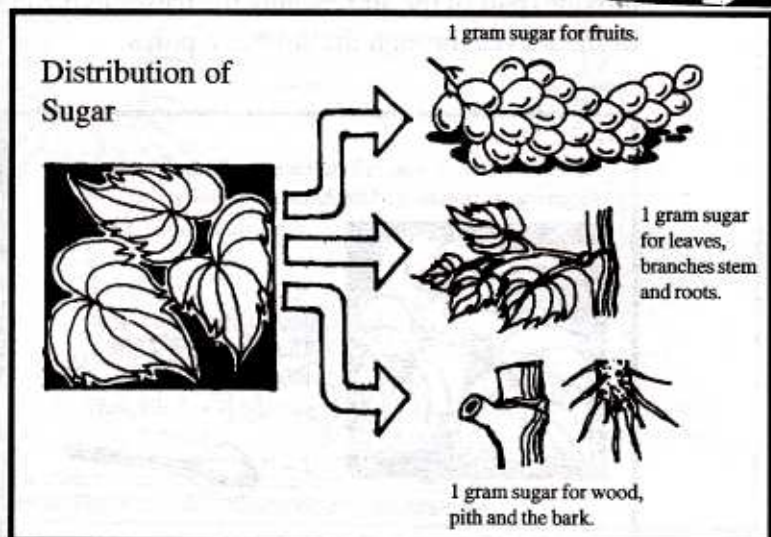
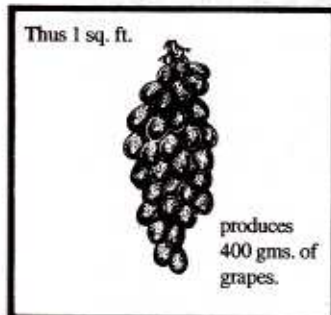
Though in each green leaf of any plant glucose is produced by sunlight, and is consumed by plants as food, some part of this glucose is used to produce product such as carbohydrates (starch cellulose, lignins, etc.) proteins, oils, acids, etc. for building their body system and also to derive energy for various physiological activities through the process of respiration.

It must be mentioned here that in the entire food chain of the ecosystem, the plants and animals respire to pump out and reduce entropy from the system and in the process build up various constituents needed for complex life processes.

- 3. It is interesting to note here that the energy stored in one gram of glucose is about 4 k. Calories. And it is estimated that after providing energy for respiration by plant for its own metabolism as food, about 3 to 4 gms of glucose is conserved per day per sq.ft. area, for future use. We name it as **dry matter** harvested by the plant per day per sq.ft. of the total sunlight falling on it.

Weight of Fruit

The fruit takes 100 gms. of sugar in 100 days in 1 sq. ft. of space. Adding 3 times water (300 gms.) the grape pulp is made, which provides the weight to the grapes.



This new insight that most of the agricultural production is made from water in the soil, carbon dioxide from the air and the energy harvested from sunlight made us understand for the first time that in order to get record yields the most important and foremost requirement is to be able to harvest the maximum of sunlight falling on our fields every day, as otherwise most of this energy is radiated back in the universe the very night.

4. With more critical studies many new findings were made.
 1. The most important finding was that to harvest the optimum sunlight the plants must build a canopy as per the index number of the crop which is generally between five to ten.

Thus if the plant's index number of leaves is five, it means to harvest maximum sunlight from one square foot of area, this plant must have a canopy of five square feet area of leaves.

2. Second finding is that each plant needs specific area for its maximum growth. For instance groundnut plant needs about one half sq. ft. of area for its full spread while banana plant needs about 25 to 40 sq. ft. of area depending on the particular variety planted. So multiplying this area required by the plant, (e.g. 0.5 sq.ft.) by the index number of leaves (e.g. 5), we can deduce that groundnut plant must have a canopy of 2.5 sq. feet leaf area in half sq. ft. of land area. Similarly, it can be calculated that the banana plant needs a canopy area of 125 to 200 sq. ft. depending on the variety of banana planted.

For instance, if the plantation distance in banana, is five feet by five feet, then area available per plant will be 25 sq.ft.. Now taking index number of banana as five, all these leaves will have a total area $(5 \times 25) = 125$ sq.ft. The best grown banana plant achieves full growth by the beginning of the fifth month after its plantation.

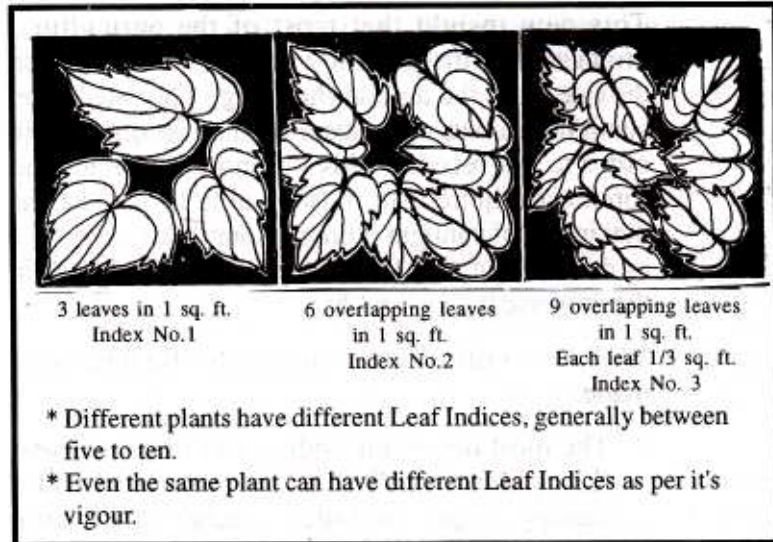
Natueco Culture :

8. It promises record assured yields through knowing plants actual fertility needs, plants geometry of growth, plants cycles of growth, plant physiology, new techniracy of canopy management & soil & water management with least external inputs & for optimum harvesting of sunlight.

Natural Farming :

8. It provides no basic insights into the various nature's processes in programming any crop production

More information is available.



By that time the plant has about fifteen well spread out leaves. That is, each leaf on an average will have spread of $(125 / 15) = 8$ to 9 square feet.

3. When one achieves this much spread of the leaves of the banana plant, it will be able to generate hundred grams of dry matter per day, from fifth month onwards for about eight months more, till the banana bunch is harvested, which, if it is record yield, must weigh between thirty to thirty six kilograms as **fresh weight** (note fresh weight is different from the dry weight). The rest of the dry weight harvested by the plant will be in the fresh weight of the remaining part of the plant. This illustration highlights that in nature's mechanism for harvesting the sun, each plant must establish its optimum canopy spread at the earliest of its life cycle (here for banana it was at the beginning of the fifth month). **So the first principle of Natueco Culture is the establishment of the canopy index at the earliest so that the plant will be capable of taking full advantage of the sunlight it has to harvest.**
5. **The second important principle is that only the mature leaves of the plant are capable of doing optimum harvesting of the sun.**

Natueco Culture :

9. It has developed the new concept of Sagriculture where abundance for every one where of everything is possible. It promises high middle class level of living for all.

Natural Farming :

9. It is confused over the difference between riches & abundance & feels increasing human needs is anti-nature.

The young leaves or old leaves on the plant are less capable of harvesting the sun. To continue the previous discussion on banana, the total life span of each banana leaf is about five months, and every new leaf unfolds in about ten days. Thus after the fifth month, three old leaves are dying and three new leaves are emerging. So out of fifteen leaves on the plant the three old and the two recently emerged leaves are not participating much in the process of harvesting the sun. So the remaining ten leaves of the banana plant must fulfil the condition of index Number, that is to have total area about 125 sq.ft. So each leaf must now have area of about 12.5 square feet and not of eight or nine square feet as in our previous discussion. That calculation is thus to be rectified.

6. When we begin to understand critically, these, and similar other preconditions of nature, for harvesting the sun we will begin to judge how "Scientific Farming" that is synonymous with "Natueco Culture" is entirely different from the loudly advertised "Natural farming". Natueco Culture clearly explains why and when we can expect and reap assured record yields and when we can expect and reap assured record yields by helping nature to establish necessary optimum conditions of the crop canopy needed to ensure record harvesting of the sun.
7. One additional parameter regarding nature's requirements for optimum harvesting of sun came to our notice while studying the crop yields of two closely placed grape vines. Both these plants had fulfilled the conditions of index number and the condition of mature leaves equally well but the yield of one plant was three times the yield of the other plant. This difference in yield was traced to the difference of the thickness of the stems of these plants. It explained that the storage organ for the photosynthesis had for some reasons failed to develop in the vine with poor yield at the time when the canopy of its matured leaves was to harvest the optimum amount of sun energy.

Natueco Culture :

10. It visualises that in near future there will be energy markets only.

All consumer goods will be from neighbourhood home farming systems.

Natural Farming :

10. It has no better alternative to fight against the present commercial market and money market systems.



Natueco Culture :

11. The present paper economy system will have to give way to new energy equivalence eco-economic system of nature.

Natural Farming :

11. The myth of present paper money system is as yet not exposed by natural farming system.

To find an answer to this problem we had to search in the books on anatomy of the grapes as well on the physiological aspects of grapes. We then deciphered that the storage organ in grape stem and branches is in the xylem and phloem parenchyma and to develop these storage layers in the stems cytokinin level in the roots of the plant must reach the optimum level, so the stem of the plant would have then become equally thick to accommodate the daily optimum rate of photosynthesis.

8. So the third important principle for having optimum photosynthesis in nature is that there should be matching storage organ growth in plants at the time when optimum photosynthesis is taking place in the matured leaves. In grapes it is about at two three months period after pruning because the new leaves of new flush have full maturity only after this period. On the other hand in banana it is a continuous process from the fifth month onwards, as in every month three new leaves emerge and three leaves die till the emergence of the fruit bunch. In potatoes the storage organ will be potatoes which is modified stem organ of the plant. In sweet potato it will be the roots while in groundnuts it will be in the seeds and in tomatoes and egg plants in the growing fruit on it as well the growing parts on it.

In addition to or in place of matching growth of storage organs, the plant can continue new growth through new flushes. The dry matter production by the mature leaves is expended in new growth and spread. But there is a limit to this growth and later the dry matter produced is stored in stems or roots or is carried to the storage organs of the fruits.

5.6 Recycling Process :

1. Nature's Ways of using Material Resources :

With the foregoing scientific understanding of nature's designs and devices for harvesting the sun let us now learn something more about nature's various devices for recycling most of the material constituents of the living and non living organic components of the eco-system.

The first and foremost of these components is carbon taken from CO₂ component of the atmosphere.

It was at one time recycled in the eco-system by natural fires in the aged forests (like recent fires in the yellow forests) or through the process of respiration in the food chain. This food chain reaches its last phase in the decomposition of the detritus matter of the plant kingdom. In this process of decomposition the detritus is first changed to humus or peat or lignoprotein part of the soil. A good fertile soil maintains its fertility structure only when the mineral part and the compost part of the soil are equal by volume.

Such soils are called **nursery soils**. Thus in one cubic foot of nursery soil one half cubic foot of soil will be of mineral part and the other one half of the well composted part of the detritus. Detritus food chain is the last food chain in our eco-system.

2. Man's First Appointment with Nature

It is with such recycling processes that nature has overcome its constraint of fixed resource availability in the system. In "Natueco Culture" methods we will need to devise some ways of imitating these processes on the farm and in the social and economic living. It may be recalled here that early economic life started when the primitive man on learning about nature's seasons cycle took to primitive farming.

Natueco Culture :

12. Natueco Culture promises to build up new enriched eco-systems four, five six onwards from the present eco-system three.

Natural Farming :

12. Natural farming promises only sustainable living as in ancient times.

It was man's first appointment with nature for yearly seasonal sowing and reaping and later amongst sharing them.

3. The Plant's Nutrient part from soil :

Introducing the concept of harvesting the sun first to a layman can be done by taking one kg. of dry matter of some green plants and then burning it completely to measure the ash content that is left over.

With such experiments one can easily understand that the fire one sees on burning any dry matter is due to the energy coming from the sun and the smoke that is seen comes from the carbon particles produced. On complete burning of dry matter with blue flames and without smoke the carbon that was seen as soot or smoke is converted to some invisible gas that we know now is carbon dioxide. With such complete burning the only remains from the dry matter is its ash. This ash is generally about six to eight percent of the total dry weight of the plant. These are generally the nutrient parts of the soil that are taken by the plant for producing the dry weight. (In burning to ash, the nitrogen part that comes from the soil is also lost. We will consider these details in the later discussion.

With this new insight, it becomes easy to learn that in the entire life cycle of the plant, the plant has taken a spoonful of ash, from the soil in which it was growing. The elements in such ashes have now been critically analyzed and estimated. It is now established that to get again equal amount of dry matter of that grain crop it will invariably need about the same levels of these elements available in the soil in its growth period. We call these elements nutrient needs of the plant. There are about twelve to fifteen important elements and some of these are needed at micro levels (as parts per million level).

Study of Mango Nutrients :

To understand this recycling process better let us now take one helpful study of mango leaves and fruits. With knowledge of this type now many have succeeded in getting one good size alphanso mango fruit weighing 350 gms per mango, in the very first year of its graft's growth.

Since the index number is ten for young mango trees the canopy to harvest one square foot sunlight, is obtained by having about hundred good size mango leaves. The dry weight of such good size hundred healthy leaves is about a hundred grams.

Research data on mango shows that 100 gram (dry weight) of the leaves contains the following nutrient levels of different elements.

Nitrogen (N) - 1.88 gms;	Ca - 2.44 gms;
P - 150 mgs;	K - 950 mgs;
Mg - 320 mgs;	Zn - 3 mgs;
S - 740 mgs;	Mn - 6 mgs;
Boron (B) - 6 mgs;	Cu - 1 mgs;
Fe - 7 mgs.	

It is also found that 100 gms. of fresh mango fruit contains about N- 0.12 gms, Ca-90 mgs, P-6 mgs, K-210 mgs, Mg-50 mgs. So only a fraction of the leaf content will be needed to make up nutrition content taken out in fresh mango fruit.

In many of our experiments we have shown that four liters of good nursery soil (that is two liters of good compost and two liters of mineral soil) can rise a good mango plant in one year, having one hundred good leaves and one 350 gms good sized mango fruits. The nutrients that these leaves and fruits have taken from the soil, measures up to the levels mentioned above and if we return the dead leaves to the same soil, the level of the nutrients is established again.

More details available

And if we also return back the skin and the stone of the fruit for recycling, then the nutrients of the fruit will also be returned as the pulp is mostly made up of sugars and carbohydrates that do not come from the soil.

However decomposing the skin and the stone components of the fruit will take time and till then the nutrients in them will be locked, but by drying and pulverising them we can hasten this process or by burning these dried parts we can get back the ash content straight away. In recycling in nature one or many of these processes can take place. But mostly the skin and stones will be consumed by sheep, rodents and later recycled through their droppings.

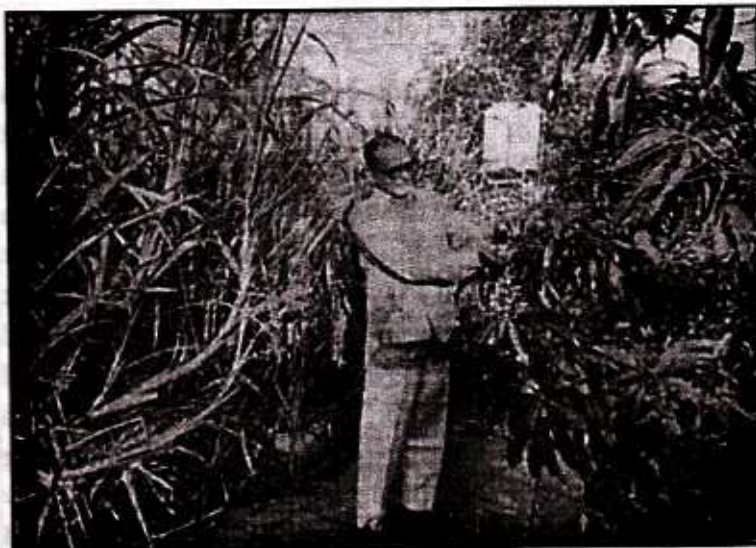
To do Natueco Culture we will have to find some ways of recycling mineral nutrient requirements of growing plant through neighbourhood resources. We will be coming to these studies in the next chapter of this book.

Sugarcane on the Terrace :

With this insight of nature's recycling of mineral nutrients in the soil, one successful experiment (later widely published in newspapers and widely displayed in the TV science magazine "Turning Point" on national network programme) in sugarcane cultivation on the terrace of a house in Bombay city, can be recorded here.

From the booths selling sugarcane juice on the streets of Bombay the experimenter brought the remains of the sugarcane after crushing. (bagasse). With these crushed sugarcane residues he filled polythene bags of eighteen inches diameter and height and open at both ends. He added a small part of nursery soil while growing sugar- cane in this aggregate.

The sugarcane-crushing slowly decomposed and a harvest of new sugarcane was possible mostly through this recycling process.



Mr. R. T. Doshi on his 1200 sq. feet terrace farm with 2.5 tonnes of sugar cane crop, right in the heart of Bombay.

From research papers we can show that one kg of sugarcane, before crushing, contains

N-1.7 gms,	P-800 mgs,
K-2 gms,	Ca- 800 mgs,
Mg - 720 mgs,	Sulphur (S) - 300 mgs,
Fe - 110 mgs,	Zn-4 mgs,
Mg-40 mgs,	Cu-8 mgs,
Mn-40 mgs.	

After crushing most of the sugar and very little of the above nutrients are extracted as juice. And if one will keep recycling the remains of the whole sugarcane plant (leaves, crushed parts etc.) the same mineral nutrients will be mostly replaced year after year to get regular record sugarcane harvests. Our experiments on these lines on other crops also invariably match those results.

Thus the nature's ways of recycling mineral nutrients make us understand the new concept of whole plant use in Home Farming which we will be discussing in the next chapter.

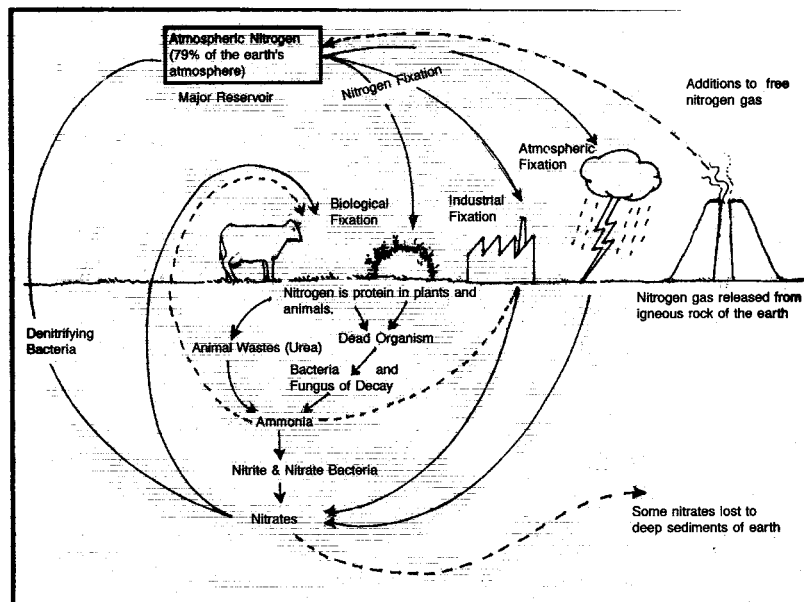
Similar other success stories on other crops are also available.

2 The Nitrogen Cycle :

The study of the mineral nutrient of plants has a history of about two hundred years. The first impression of the German Scientist Justus Von Liebig that only the ash nutrients are important in the mineral recycling of the plants nutrient and that there is no need to worry about nitrogen was first corrected, when in 1958 Knop and Sachs succeeded in bringing plant growth to full maturity on artificial nutrient media. Liebig must have been side tracked because on burning plant material the remaining ash does not retain nitrogen in it. Gradually a new chapter, on nitrogen nutrient supply to the plant and the nitrogen cycle working in nature to achieve this feat, was added in the recycling theory of mineral nutrients of the plant.

This study led to the discovery that though nitrogen is abundant in nature (as eighty percent part of the air) plants cannot assimilate nitrogen directly from the air. Plants can take most of their nitrogen through roots only. Really speaking over every sq. foot of the soil there is so much of nitrogen, that, if weighed, would way about eight hundred kilograms. But the roots can take in nitrogen only in the form of nitrate and/or ammonium radicals.

To establish such provision for roots in the soil, nature takes help of different types of micro-organisms. Some of them break down the complex products, proteins produced by living organisms to run their life processes which are decomposed after death. These are called ammonifying bacteria. Under favourable conditions nitrifying bacteria can change these ammonium ions to nitrites and later to nitrate ions; which again after entering in the roots are converted back to ammonium ions.



The Nitrogen available at any place in 1 sq. ft. air column (approx. covering one human head) is 700 Kg. But living organisms can have their Nitrogen only through the complex Nitrogen Cycle involving Nitrogen, Nitrite, Nitrate, Ammonium Radicals as well as ammonia, amine, amide groups, peptides and proteins.

The requirement of Nitrogen to obtain 1 Kg. of yield are very meagre

On the other hand this nitrate radical is highly soluble in water and is leaked out or is attacked by other types of bacteria called denitrifying bacteria that reduce and mineralise nitrate ions to nitrogen as a final turnover and return this nitrogen back to the air.

The other media through which nitrogen can reach the roots of a plant are the bacteria called azo and rizo who can fix nitrogen from the air. The rizo bacteria are nodule forming bacteria and are found to be of great symbiotic help to provide necessary nitrogen from the air to the host plant and then to the soil. This nitrogen is then available for absorption by the roots of the other plants.

The basic feature of nitrogen fixing azo bacteria is that they convert atmospheric nitrogen molecules (di-nitrogen) into ammonia or ammonium ions. But the other important aspect of these bacteria is that after they build up ammonia they cannot tolerate it in their immediate environment. These ammonia products should be immediately scavenged from their environment by nitrifying bacteria converting ammonium ion (NH_4) into nitrate ions (NO_3).

Crop	N in 1 Kg.
Wheat grain	2.50
Straw	0.50
Rice (Kernels)	1.20
Pea seeds	4.50
Potato	0.32
Cabbage	0.33
Tomato	0.26

For seeds these are 0.2 %

For Vegetables 0.03 %

For Legumes these are 0.04 % but they have their own rhizoflora to collect the nitrogen.

But these nitrifying bacteria cannot function if there is decomposing material nearby as these take their carbon directly from the carbon dioxide of the air and not from the decomposing organic carbon compounds in the detritus.

In symbiotic associations of bacteria and plants, the plants create a special environment which helps the bacteria to function. They create a special chamber called a nodule where the bacteria can live. Air that is admitted to this chamber is first cleaned of its oxygen content by means of hemoglobin molecule called leghemoglobin, because these bacteria cannot function very well in the air with normal oxygen concentration. The plants supply the bacteria with nourishment from their sap.

The bacterial enzymes which are involved in the nitrogen fixing process need a number of elements. Electron transporters like Flavon Adenine Dinucleotides (FAD) need cobalt to mediate their synthesis. Leghemoglobins need copper. Nitrogenases, the enzymes that catalyse nitrogen reduction, need molybdenum, vanadium, iron and sulphur. The hydrogenases which catalyse the hydrogen production generated at the same time as ammonia, need nickel. All the varieties of the pulses and crops like groundnuts and soyabean, rich both in protein and oils, can also build up their own and soil's nitrogen reserves through this process of nodulation. The bacteria for every crop variety are of different species.

In nitrogen cycle we have a glimpse of the other side of nature's working methods. Though there is abundance of nitrogen in the air, it is only channelised through a complex networking before it is made available. First to the plant and then to the animal world and micro-organisms through the food chain or for some group of plants, through symbiotic associations.

While dealing with Natueco Home Farming this information will be of immense help to us, to understand how to improve our soils in nitrogen content through the techniques of

1. Whole plant use and
2. through nodulation on the roots of the pulses.

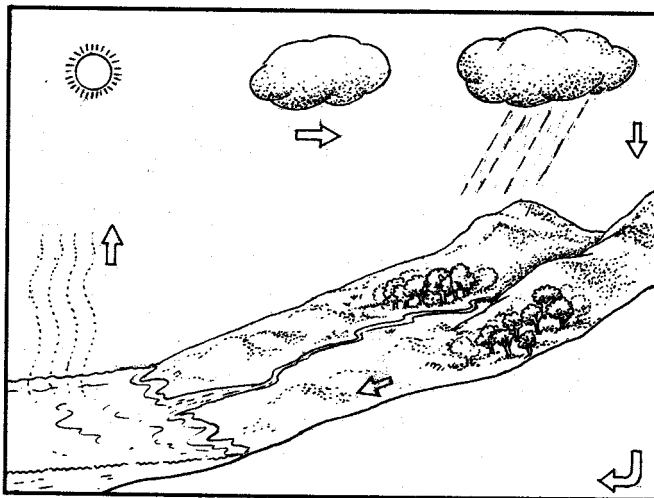
3 The Hydraulic Cycle :

The hydraulic cycle is the cycle run by the nature to take water from oceans to the lands, and the mineral contents from the lands to the oceans. Life originated first in sea water but in the course of evolution it migrated to the land. The present age of the earth is over four billion years.

Compared to this period, the angiosperm and gymnosperm plants are fairly of young age. All life cycle on land depends on the supply of rain water and the life cycle in the oceans depends on the supply of the nutrients carried through the water returning back to seas and oceans through rivers.

Huge amounts of Sun energy are annually used in running this hydraulic cycle.

The evaporation of one liter of sea water requires about 600 K Cal of sun energy. So every liter of water that we get through rains is that much precious. These clouds are later carried from one place to another by huge mass of moving air commonly called strong winds.



600 Kilo Cal. of Solar energy is used per sq.ft. to evaporate the sea water. Plus the wind energy required to transport the water vapour is also derived from solar energy.

Water Cycle

But as Man emerged into the picture, this scene began to change. Man, by one well known definition, is a tool using animal. For using tools one has to earn and use energy. With such tools and implements, Man started agriculture and tried to build up and store additional food and energy supplies in the system, by harvesting the sun through biomass increase over the neighbourhood lands. Thus, by digging wells and using draught animals, he increased the provisions for timely watering of his agriculture. This helped him to increase greening at places where greening was previously not possible other wise; and thus he increased the life carrying capacity of his neighbourhood ecosystem.

It is necessary to appreciate that the energy of draught animals which is used in agriculture, would otherwise be wasted without doing useful work of increasing the productivity of the land area. We can turn this input for additional harvesting of the Sun, to support both animal and man together in more harmony.

By evolving man as a tool-using animal, nature has placed him in a different level of its scheme. With further insight in nature's working of this ecosystem, we shall see how it is possible to increase the biotic potential of our present system not only tenfold but hundred fold.

The system of Critical Scientific Farming can achieve this in the next decade or so, through Prayog Pariwar's new approach to Natueco Culture.

The Momentum Gathered :

The great inherent potential of Prayog Pariwar's new vision of "Natueco Culture" is now getting increasing recognition. It is now firmly felt among our different enterprising experimenting groups, that this new insight and thinking, is ushering in a new era of "total development", for the entire human race and upto the last man on earth. Various interested groups from all over the country are now reaching the Prayog Pariwar on their own for active experimental participation with us. They all show an eagerness to venture, to test and to improve many of our present findings, achievements and ventures.

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Chapter 6 :

Home Farming :

Agriculture for Consumption

- 6.1 Our households
- 6.2 Assured record yields
- 6.3 Fertile nursery soil
- 6.4 Whole-Plant use
- 6.5 Soil building
- 6.6 Wild Farm and nursery orchard phase
- 6.7 Steady yearly returns
- 6.8 Oilseeds and pulses
- 6.9 Farm reservoir
- 6.11 Micro-climate cultivation
- 6.12 The Farm-house, the farm shade and open space

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Agriculture for consumption

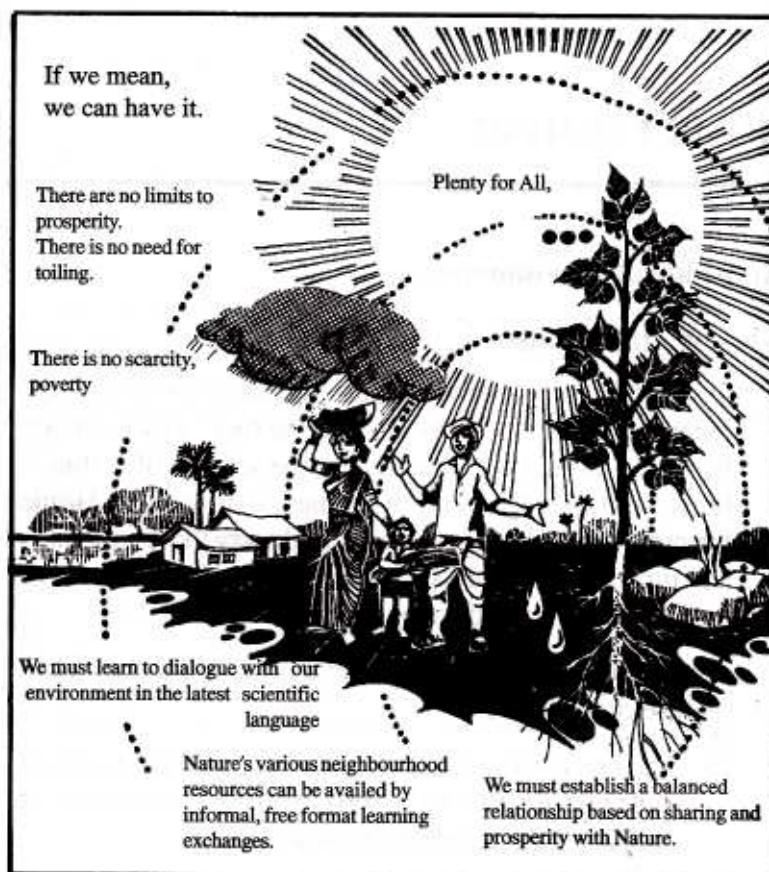
6.1. Our Households :

The term ecology derives from the Greek root "Oikos" meaning "house". Combined with the root "logy" ecology basically has to be understood as the science of Nature's household management. In the new approach on Home farming, we are trying to convey and carry these structures and functions of nature's households unto the door steps of the last man for total development of his household.

Some of our findings and achievements in this new field of developments are :-

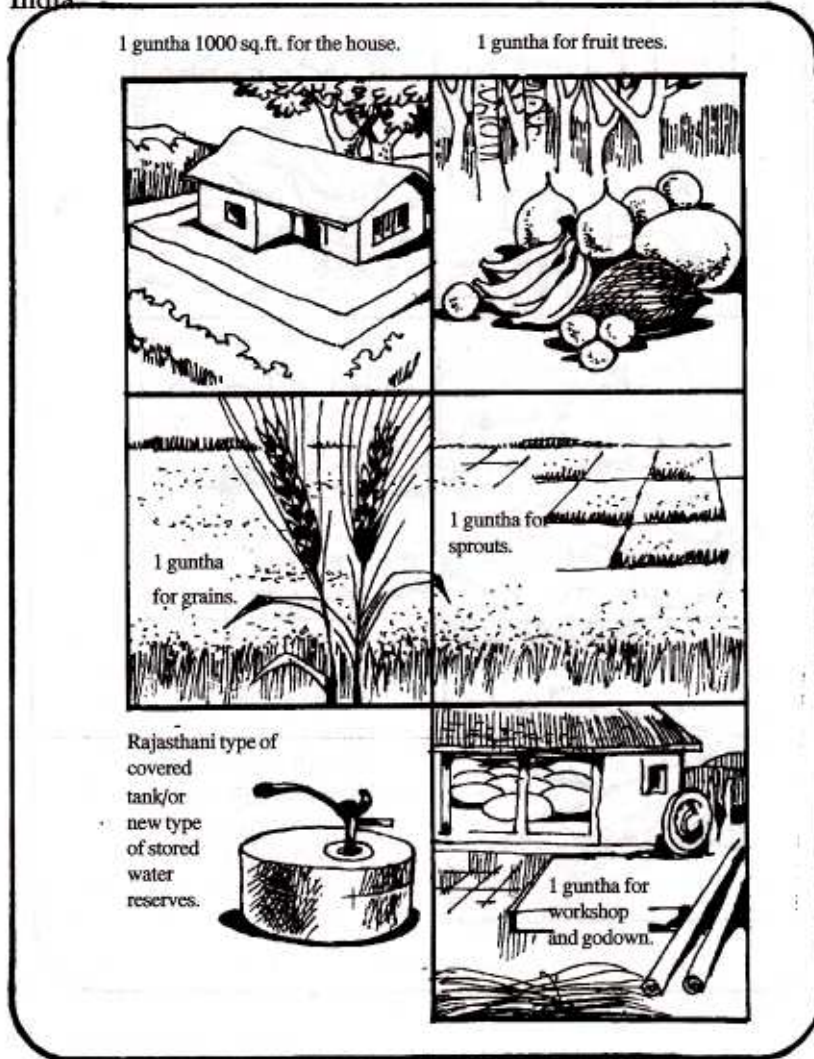
1. The knowledge and understanding of the process of harvesting the sun, will generate new feel of development amongst the rural masses.
2. This will make them understand for the first time that there is no real resource crunch in their neighborhood that can prevent their all round development, as Nature has evolved this rich ecosystem starting from more stringent conditions than the present.
3. Through the process of greening and through proper networking of daily harvested energy pools, one can build up various new energy chains in one's neighborhood. With this, in two or three years period, cumulative and progressive enhancement and enrichment of the neighborhood farm resources will be easily achieved. A new type of accelerated wealth generating system, called Home-Farming eco-system, will emerge near each house.

Homestead wealth for All



4. For a typical family of five persons, (including children and grand parents) who have learnt efficient harvesting of total daily sunlight, a farm of the size of ten thousand sq. ft. (one tenth of a hectare) will be more than sufficient to earn a higher middle class standard of living, according to the current norms.
5. The only major investment for this Natueco Culture development will be new knowledge, science, new thought and ventures. Simultaneously with the enhancement and enrichment of natural resources there will be progressive enrichment and enlightenment of human resources.

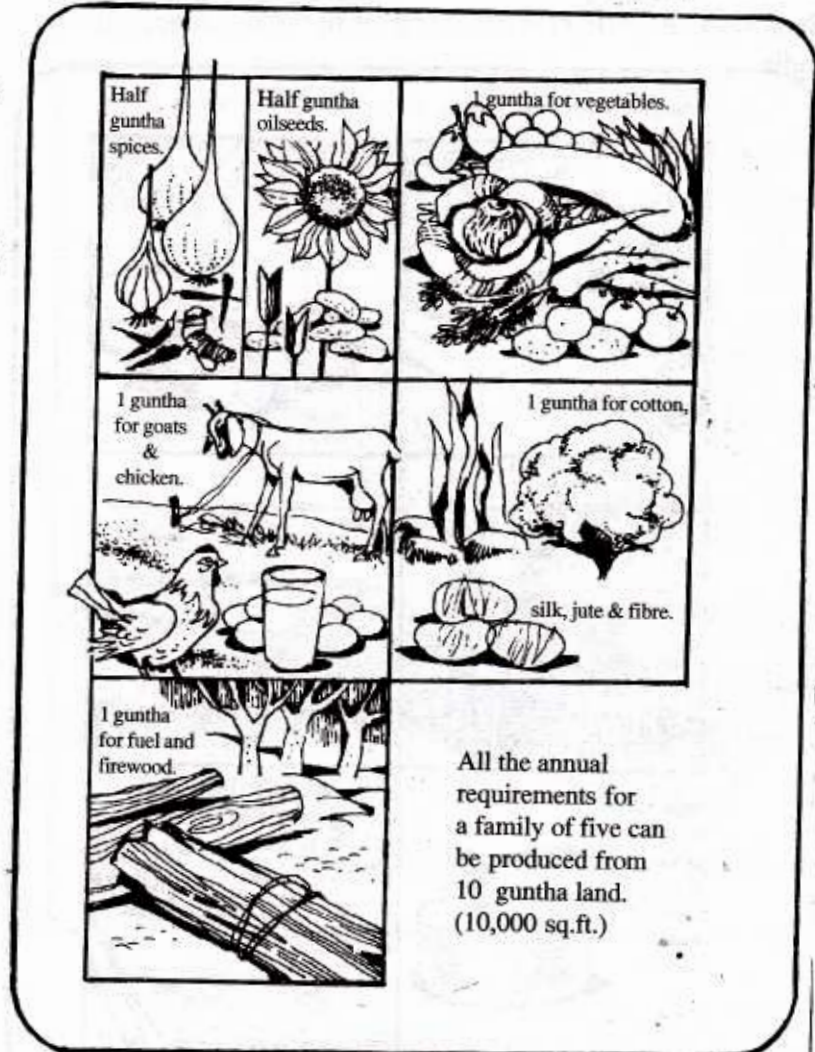
Such study experiments are going on in various places in India



The first network of these ventures as presented here has emerged linking many distant places. Some of which are Nandurbar, Dhule, Bhavnagar, Jaipur, Panvel, Khudawadi, Solapur, and Satara.

Nature can give us in plenty, whatever we need, but we should know how to obtain it.

Case studies available.



All this can be achieved through meagre water requirements, using wastewater and locally stored rainwater.

Such a “grey matter revolution” in minds and brains of the community will create many non-establishment situations for convivial life and living and for more leisure and freedom for enjoying true harmony with the nature’s ecosystem.

6. This new style of house keeping will radically change the present monetary economic system to a novel energy currency unit exchange system (ECUES) . The word economics comes from the same root “Oikos” meaning a house, and it can be understood as the science of “house keeping” with the community more than market or state running of the community.

Energy metric.
More details available.

6.2. Assured Record Yields :

Natueco Culture, we have seen, is in a different sense critical scientific farming. In critical scientific farming we are able to quantify the limits of our returns and the reasons of our successes and failures. It is always an innovative and interactive challenge and venture. As seen before, with efficient harvesting of the Sun, there is a daily gain of about four grams of dry mass per square foot of sunlight harvested.

The record yields harvested by a number of our ace farmers, many of whom have bagged national awards with their successful achievements, are worth studying here. We will then discuss how each of these results can be harvested at the door step of every house in experimental units of ten thousand sq.ft. plots.

In case of many fruit plants like mangoes, grapes, banana, pomegranate, custard - apple, limes, oranges, guava etc. the maximum achieved record yields are : one half kilogram per square foot area in one season, and about one kilogram in three seasons. Starch crops such as potatoes, sweet potato, elephant fruits can easily reach the level of one Kg per sq. foot area of their growth.

CROP	APPROX. RECORD YIELDS PER SQ.FT.
1. Fruit Plants Grapes, Banana, Mango	500 gms
2. Starch Crops Potatoes, Elephant foot	1000 gms.
3. Grain Crops Millets, Rice	125 gms.
4. Watery Vegetables Cucumber, Water Melons	2000 gms.
5. Nuts - Groundnuts, Oil seeds, Sunflower	60 gms.
6. Pulses - Pigeon Pea etc.	50 gms.

Grain crops like maize, rice, millets have reached the level of one Kg of grains per eight sq. feet in one season for semi late varieties. Water melons, cucumbers, red pumpkins, tomatoes and many other vegetables can yield a crop of average two to three kilograms per sq. ft. On the other hand 60 gms. of ground nut seeds per sq. foot are harvested by some groundnut growers. The results for many other oil seeds are similar to groundnut. Pulses reach the average to about one kg dried seeds per twenty square ft. of soil.

Now if one farmer has achieved these results in Nature, we see that it must also be Nature's promise for each one of us to take similar yields at one's very door steps. Why each one of us is not getting yields upto even half of these record levels, is only because we are not enlightened in the nature's methods and ways of working while achieving these feats.

Some Illustrations:

1 Record yield of Potato:

Let us first consider how we could get record yields of potato crop, with mature scientific insight in various factors.

These experiments are good for
City Farming.



Details are available to venturers in Potato Crop.

Before planting potato we will study the mineral nutrients which the plant will remove from the soil when it will yield one kg of potato in one sq.ft. area.

In research papers on potato we find that one kg of potato removes from the soil 6 gms of N, 2 gm of P_2O_5 , 9 gms of K_2O as major nutrients. This means that the soil in which we want to take potato crop, must contain these mineral levels per sq. ft..

Now we have already seen that Nature achieves these mineral levels in soils by the recycling of mineral nutrients through decomposition of various materials. Let us take cow dung as one such material. Now a well known Russian book gives us the following information on cow dung.

One kg of well decomposed cattle manure contains:

N - 20 gms,	P_2O_5 - 8 to 10 gms,
K_2O - 24 to 28 gms,	Ca - 28 gms,
S - 4 gms,	Mg - 6 gms,
Boron-20 to 40 mgs,	Mn - 200 to 400 mgs,
Cu-20 to 30 mgs,	Zn - 125 to 200 mgs,
Cobalt-2 to 3 mgs,	Molybdenum-2 to 2.5 mgs.



Ginger in 1 sq. ft.

Various ventures in soil preparation can be comparatively studied.

It is further known that Organic fertilisers generally release one third of their nitrogen and phosphorus contents in the first year. So with this information we can take one kg of cattle-manure as a supplement to establish the mineral level of the nutrients in the soil to harvest one kg of potatoes.

If we further pursue our study we will find that one Kg. of good cattle manure is nearly 2.2 litres by volume and potato grows well in acidic nursery soil. Hence we must add 1.8 litres of mineral soil to make it acidic nursery soil.

With such information it is now easy for any one of us to experiment with potatoes grown in only 4 litres of nursery soil and try to obtain record yield of one kg per sq. ft. of sunlight. But there are Nature's other conditions yet to be fulfilled. We have so far fulfilled only plant - friendly conditions. The condition of having total leaf area of about five sq.ft. (assuming index number as five) is a must to make this experiment Nature - friendly. If we achieve this level of leaf index area in the early growth period of the plant, the final results will be much better.



Experimenting Groups with Record Potato yields

So by knowing the conditions of potato growth more fully we will become more plant friendly and nature friendly so as to make the result man friendly too.

In case well decomposed cattle manure is not available, we must turn to nature's other ways of recycling these nutrients to the soil. In one such experiment, we found that the droppings of silk worm larvae are a rich source superior to cattle manure to get record potato yields, because these droppings come only from the mulberry leaves consumed by silkworms. Knowing this, instead of using larvae dropping we may use straight composted mulberry leaves also. Many other similar substitutes may also be discovered. We are going to consider many other such alternatives in our discussion on soil, later on in this chapter.

P.P. methodology believes in

- * Experimental attitude.
- * No stock answers.
- * Constantly seeking new alternatives.

2. Record Yield in Rice:

Let us now consider another record yield, for instance that of rice which is one Kg. in about eight sq. ft. of area (i.e. 40 Quintals/Acre).

Crop - good for City Farming ventures.

For harvesting this yield let us begin by studying various aspects of rice plant growth. Take one variety that weighs 25 gms per thousand seeds. The weight of one seed is then 25 mgs.

Ventures in recycling the rice straw as in 'One-straw Revolution' to understand the principles behind recycling in Natueco Culture as against Natural Farming.

Now if a good tiller of this variety has hundred seeds when ripe, then each grain will yield 2.5 gm of seeds after harvest. It is further seen that the ratio of the seed to the remaining part of the plant is about one to three. So the total dry weight of the plant after it completes its life cycle will be ten gms.

Thus each seed has to grow in its full life cycle, 400 times its original weight at the time of sowing.

Now we are expecting one kg of rice in 8 sq.ft. of area. So that 400 rice plants of the type described here should stand in eight sq.ft. That is about fifty plants should be standing in each sq.ft. area of our plantation.

On studying the mineral requirements of rice plants producing one kg of seeds we can satisfy them in various ways by decomposing various green manuring plants at the site of the growing seeds. Generally the total ash content is about five percent of the total dry content of mature plant. The next important condition we will have to fulfil is that 50 plants in one sq.ft. area should have a total canopy of seven sq. feet as the index number of rice is about seven.

But leaves of rice plants mature at different times. It is found that most of the weight in the seed comes from the last flag leaf and very little from two or three leaves below the flag leaf. So if this canopy part has some disorder or stress then inspite of good growth of the plant the grain yield will suffer.

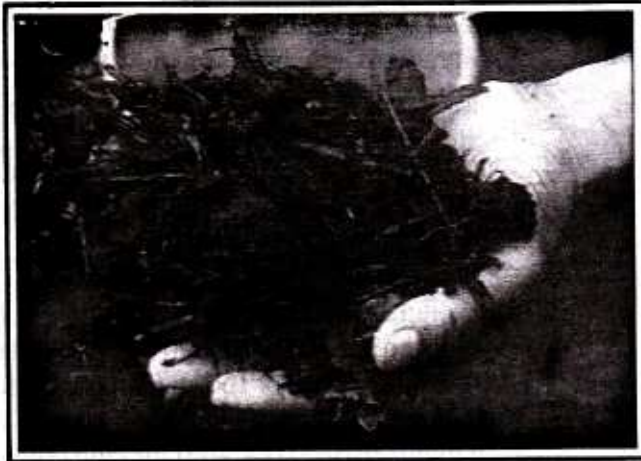
The two examples given here will give many clues to those who want to venture to produce record trial yields at least for plots of small size say from one sq.ft. for potatoes to eight to ten sq.ft. for rice experiments.

6.3 Fertile Nursery Soil:

1. In our illustrations we have seen that the success of the experiment depends on the nutrient level of the soil, called the fertility factor of the soil. One can always achieve this fertility level of the soil by proper recycling of various bio-degradable products.

Various case studies available.

The organic things generally recommended for building fertility are oil cakes, sheep and goat pellets (droppings), poultry manure, tender tree tops, green manure, fresh ash of dried parts of wild plants in the compound or in the farm, fresh well composted farmyard or other manure, kitchen - waste, liquid manures containing urines of animals and Man, specially prepared bio-dung and so forth.



Any good virgin top soil
+
Fully composted cowdung or
green manure
Mixed in equal volume
=
Good Nursery Soil

With experience one can see how easy it is to maintain the fertility level by properly collecting and incorporating these things in the soil system so that it will be optimally available in the early growth cycle of the crop as most of these mineral parts of the soil are generally harvested in the first growth period by the plants and later before tillering or flowering phase of growth.

The term Nursery Soil is used for soils that contain well composted organic parts and mineral parts in equal volume. This well composted organic part is generally of the nature of humus or peat or lignoproteins. Thus while the fertility part relates to the available mineral nutrient level in the soil, the adjective nursery relates to that factor which gives structure and form to the soil.

The fibrous lignin and cellulose parts of the plant materials get decomposed and changed to form these parts of humus or lignoproteins when they are biodegraded. These parts then impart good form and structure to the soil. Such soils can maintain good moisture level and air content favourable for good growth and flush of roots in it.

With further original research on how much soil is needed by a plant to have efficient harvesting of sunlight from one square foot of area, and the procedures to build and maintain good type of fertile Nursery Soils with ease and with in-depth insight in the process.

Some interesting ventures for city farming are available.



English versions to be available soon.

We have brought forth two publications on these topics in Marathi. These books are now widely studied and experimented by enthusiastic garden lovers and farmers from both rural and urban cross sections of the society. Let us see the gist of some of these relevant important revelations.

2. The Volume of Soil :

The volume of soil needed to harvest the Sunlight over 1/40th Acre (or approx. 1090 sq. ft.) per day is about 100 cu.ft. minimum or 160 cu.ft. maximum depending on the nature of plantation. Thus if we have to plant ten fruit plants in one 1000 sq.ft. of land then each plant will need only 10 cu.ft. of good fertile soil to optimise the yield by becoming soil-friendly and plant-friendly. On the other hand if we have to raise say three hundred twenty nursery fruit plants in the same area in polythene bags (with both ends open) or in nursery soil heaps or hills or pits or trenches, then each plant will need about one half cu.ft. of soil for good growth.

One cubic foot of soil is about twenty seven litres. So it comes to about 2700 liters to 4320 litres per 1000 sqft. Rounding the numbers we find, that for harvesting one square foot of sun energy daily, maximum four litres of good Nursery Soil will suffice for ideal vigorous plant growth.

3. The Nursery Part of Soil :

To have good Nursery Soil of four litres we find that half of its volume should come from well rotted compost or other such products with good levels of humus or lignoprotein or peat parts in it. That is two litres of one of these material will have to be sought or made, to build up proper form or structure in the soil aggregate we will be using.

Component 1



2 meter bag.

Childhood experiments: Pumpkins in pots, Watermelons in riverbeds, Bananas in stone heaps, experiments in pots and waste spaces.

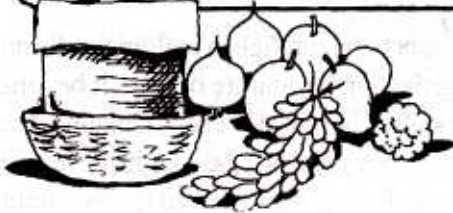
↩ New experiments : Small bags opened from both ends, filled with dry twigs, leaves and soil, produce

annual needs of ginger, groundnuts, onions, and cucumbers.



Terraces using weeds like Congress grass etc. can support potatoes, grapes, lemons, custard apple, mangoes etc.

Cultivated in bags with Five litres of Nursery Soil.



Critical understanding of Nursery part (the tilth & structure) and the fertility part (the nutrients) of the soil is possible after doing parallel experiments.

The weight of good composted material is 400 gms per liter or about 10 kgs per cubic foot of it. As most of this part comes from decomposition of fibrous material of plants we have to make this provision only once in the beginning. Then the composting of the roots, the leaves, the stems and many other fibrous parts of the plant (husk, bagasse) growing in this soil will be returned back to maintain this important component of the soil.

It is found that out of the total organic component (primarily, lignoprotein) of the soil, generally one third is finally mineralised and lost forever. That means we have to add this much quantity of well decomposed material to the soil every year, through the quantity regenerated from the plant parts that are grown in the soil itself.

We therefore, recommend planting one grain crop of about hundred days' duration, to supplement this component. Thus in case we intend to grow succulent crops only, throughout the year, in four litres of soil, there is no way to get replenished the quantity of lignoprotein permanently lost during one crop, before the next crop is planted. But growing a fodder or grain crop, between two successive succulent crops, is a natural way of generating the required lignoprotein replenishment, through the remains of the grain or fodder left in the soil after harvesting.

With this important breakthrough in building, collecting and preserving the nursery nature of soil, it becomes clear that in (Scientific farming) Natueco Culture, a fixed volume of good nursery soil is to be sought, developed, accumulated or collected only once at the beginning. And we can start doing so in units of four litres and immediately bringing it under greening to start the process of harvesting the sun for further cumulative enhancement and enrichment of our soil resources.

The present price of 1000 sq.ft. of good land is about two thousand to three thousand rupees (at Bombay Rs. 80,000/- to Rs.1,20,000/- per guntha). So by creating or/and accumulating about four thousand litres of nursery soil over 1000 sq.ft. land area, we are really creating permanent wealth on the otherwise waste land as we had not, till then, been able to harvest the sun energy falling there. So one cubic foot of such soil amounts to inputs of about twenty to thirty rupees maximum or twelve to eighteen rupees minimum on our farm. That is each unit of four liters of such soil will be, at market value, of worth two to three rupees minimum.

4. Some Ventures :

Many resourceful venturers in this venture group of soil making and accumulating, have by now revealed various new processes to achieve this goal in the minimum time. All waste lands that were never under cultivation for years have generally (except those which are too rocky) a layer of at least three or four centimeter depth of nursery soil. This is the nursery soil that nature has created through ages. If we scratch and collect it and preserve and improve it we find that four cms of soil on 1000 sq. ft. of land is about four thousand litres or 160 cubic feet as required by us for keeping that area under full production with proper heaping of this soil.

Case studies available

Illustration - A heap of forty litres of soil at one place will be enough to harvest sun falling on ten sq.ft. of area by using vines or trees to grow in the heap and having a canopy spread of canopy ten, into the index no. five of the crop, that is, about fifty sq.ft.)

Alternately, if we find some trees in our locality having a good canopy and covering say of 500 to 1000 sq. ft. of area then the yearly shedding and dropping of the leaves of these plants when properly composted in heaps or raised beds will provide the necessary lignoprotein material for building nursery soil.

So also different types of straws and thrashed parts of the grains or bagasse from sugar cane yield high quality fibrous material suitable for producing high quality lignoprotein to improve the structure of the soil. The only condition to get these rapidly degraded is to beat them to remove any polish that is there on it and to soak the beaten mass one or two times thoroughly, and then maintaining maximum humidity/moisture in the heap. Generally one and half kg. of dry matter yields compost of about one to two litres by volume, i.e. to bring ten sq. ft. of sun area under good nursery soil the initial requirement of twenty litres of composted material can be met after having about twenty to thirty kg. of any fibrous plant matter collected and composted. But, one has to remember, when once this feat is achieved the soil will not need any reclamation from plants growing out side these ten sq. ft. To maintain its nursery structure forever; at the most we will need one season of straw or fodder giving grain crop raised in it to recoup the yearly loss of humus or lignoprotein.

6.4. Whole Plant Use :

1. Nature has originated and maintained the entire food chain with the evolution of green plants. These plants after death and decomposition by micro-organisms have accumulated through the ages a new grey profile. We now term it as soil.

To build up one hundred to hundred and sixty cubic feet of soil per 1000 sq. ft. of land, our best resource will be the plants that can grow or are growing in the vicinity and on our farm.

The herbivorous animals fulfil their entire mineral needs and daily energy needs by consuming different parts of the plants. The browsers like goats or the grazers like sheep take mostly to the tender part of the plants, while cattle take to the rough cellulosic fibre part of the fodder and camels and elephants can use and consume even woody parts of trees. Naturally goats and sheep have less of fibre content in their dropping while cattle dung and elephant dung will have different structure as per the fibres that are ruminated, softened and are returned through these dungs.

Let us look at this process from a new angle for studying the general nature and composition of each and every part of the plant and helping soil aggregate to become and remain as fertile nursery soil.

2. Composition of Different Parts of Plants :

Any newly growing part of a plant must have all micronutrients and phosphate contents in it because every new cell in the meristem needs all of these provisions before it comes into existence. Thus all the meristematic parts of all the plants in our neighborhood are capable of providing these micro nutrients to us to improve the necessary mineral contents of our soil. Sheep and goat droppings and poultry manure are highly valued for their high level of phosphorous content. But these are really rich sources for various micronutrients that are also excreted along with phosphorous. The feed of the poultry birds is made of seeds, and each seed has in it a mature embryo as also the provisions of all the micronutrients in the seed parts to help the embryo have good cell division while growing.

Component 3 New thinking about fertilizers.



Tender shoots of plants provide Zinc, Phosphate and Boron.



Green leaves provide Nitrogen, Magnesium, and large amount of Potash.

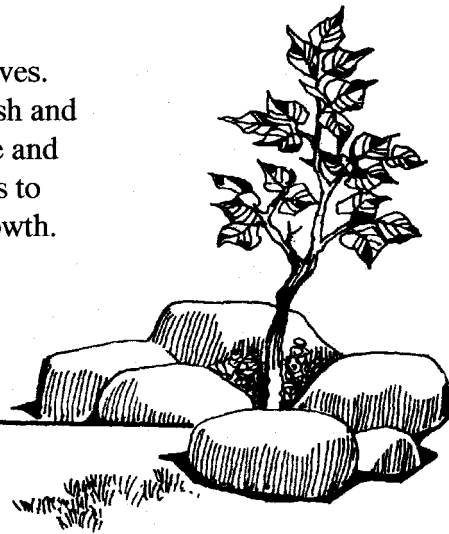


Dried leaves offer Calcium, Silica, Boron, Iron and Manganese.

Plants with gum contents, release nutrients from the soil.



Recycle plant leaves.
Let them rot, crush and
extract their juice and
feed it to the trees to
enhance their growth.



So by sowing seeds of pearl millets, black grams, mustards and seeds of grasses, weeds etc. we can get these micronutrients as an addition to soil fertility, by allowing the seeds to germinate and then returning them for decomposition after the first eight or ten days of their growth. Oil cakes can also be taken as good supplements for various micronutrients as these are the remains of the crushed whole seeds with their embryos. The most well known of the plant "tops and tips" that we use daily are tea leaves and tea powders. If a family is using ten gms of this powder per day, the yearly turnover will be about four Kg of these tips. By proper recycling of these leaves we can easily keep 20 to 30 cubic feet of our nursery soil fertile with necessary level of micronutrients in it. When the new growth, the new flush begins to lose its tenderness and as the leaves expand, the mineral nutrients that are necessary for this growth are nitrogen, potash, magnesium, sulphur, iron, manganese and copper. Since these are necessary for the healthy growth of chlorophyll so healthy leaves of the plants on recycling will yield these minerals back to the soil.

As the leaves mature with age, calcium will be incorporated more and more in the cells. When these leaves age and die before falling from the plant most of the mobile contents of nutrients are carried back to the plant for further use or as a reserve for new growth; nitrogen, phosphorous, potassium, magnesium, sulphur, zinc, copper are such elements. But the elements like iron, manganese, boron, calcium are not returned to the plant as these are immobilised in the system. So one can now learn how on decomposition of tender leaves and mature old green leaves one can get all the mineral nutrients back for the soil.



Photo of Maize in the bag in the soil built up like this.

On the other hand if we return the dead fallen leaves of a plant to the soil iron, manganese, boron and calcium will be returned back to the soil after complete decomposition.

To build up fertile soil one must learn these differences in composted materials composted at different periods of their growth. A new concept of bio-dung has now emerged because of this basic study.

Next, for growth, the roots need phosphorous and calcium for their early growth, while we have seen that leguminous plants with nodules on roots seek out from the soil, cobalt, copper, molybdenum, vanadium, iron and sulphur.

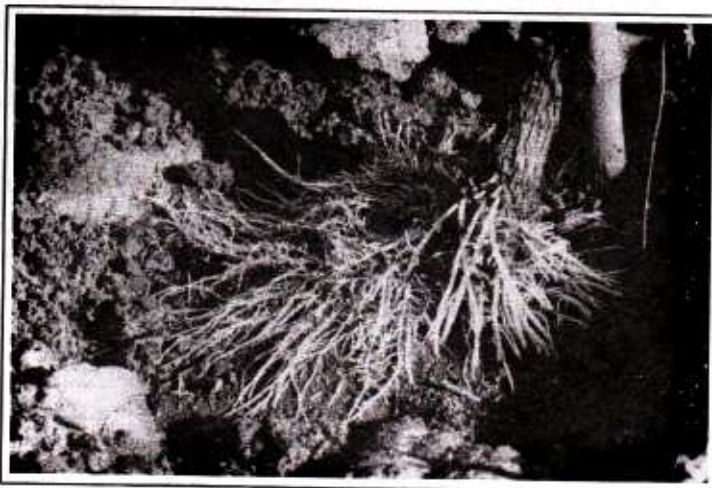
Crops also differ in their nutrient requirements. Thus legumes are characterised for high calcium and sulphur uptake while potatoes, sunflower take a lot more potassium. The straw parts contain potassium and calcium two to three times higher than the seeds they produce.

The response of plants to the availability of ammonical or nitrate nitrogens in the soil depends on the pH of the soil. In the neutral solution ammonium salts are taken up more but it must also have proper supply of calcium magnesium and potassium in the nutrient zone. In the case of nitrate nutrition, adequate presence of phosphorous and molybdenum is important. Though plants can take nitrogen only through nitrate or ammonium ions, nitrate ions can be utilised with molybdenum helping it to get changed to ammonia in the plant, but ammonium nitrogen may lead to ammonium poisoning if there is little availability of carbohydrates from leaves or germinating seeds to utilise it for further processing of different organic products.

Roots also exude sugars, amino acids, organic acids, smaller amounts of vitamins, enzymes and some growth substances - cytokinins and gibberellins. As also by acidulating effect of root exudates more phosphorous is made available to plant from the difficultly soluble compounds.

As the plant grows the hemicellulose and cellulose components of its body begin to accumulate. And with further maturity the lignin component of the plant system also gets accumulated. These cellulose and lignin parts of the plants on decomposition yield humus and lignoproteins. So returning these parts to the soil, in open pits or heaps or bundles or open trenches, aerobic decomposition in situ will go on adding more of these components of nursery soil that give our soil the form and structure needed for lush, luxuriant succulent growth of the roots. Prayog Pariwar has by now well established the advantages of this open pit or heap bundle method of aerobic composting in-situ. These matters provide good mulch as well.

While decomposing above ground, nitrogen needed for the decomposing microflora, is harvested from the air to build lignoproteins and humus. The activity of these microflora also releases auxins.



A thick mat of white rootlets of a grape vine, the real organs of cytokinin production.

The feed back between roots and tops of the plants is the key to understand the plants vigour and productivity.

Under such half composted black coloured mass we find a very good flush and thick mat of white rootlets, as it is now well known that auxins stimulate new root growth. These roots are the real organs of cytokinin production in plants. The vigour and health of the plants mostly depends on the level of cytokinin in the roots.

So by learning nature's ways of making various of these provision of keeping and increasing the right form and structure of the soil, Nature Home Farming will begin yielding record yields at every square centimeter of the farm.

Let us now reflect and consolidate what we have gathered so far in our efforts to establish on the fertility level of nursery soil.

It is interesting to note here that if we succeed in reaping full sunlight on one sq.ft. of soil in one year then the maximum annual dry matter accumulation will be 1440 gms (about one and half kg). The average ash content in this much of dry matter is about five to six percent by weight. Most of the part of this ash is calcium and potassium and these are not rapidly depleted in most soils having good nursery soil form. So it is only the other micronutrients that we have to return to the soil, by incorporating in the compost, the ash of tender parts, the pulverised dried tender parts or crushed tender parts in proper proportion. Generally only some part of the plant is consumed by us and the remaining part of the plant is readily available for recycling. So every little bit is to be really recycled in the well developed closed ecosystem of Natueco Culture. In phase two of our discussion we will give illustrations to amplify this point.

After considering whole plant use as Nature's way to provide micronutrients back to the soil, another different aspect of whole plant use should be learnt for Home Farming on scientific lines. We will call this phase one.

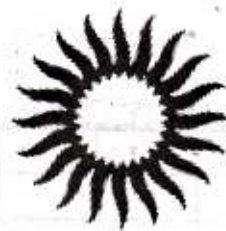
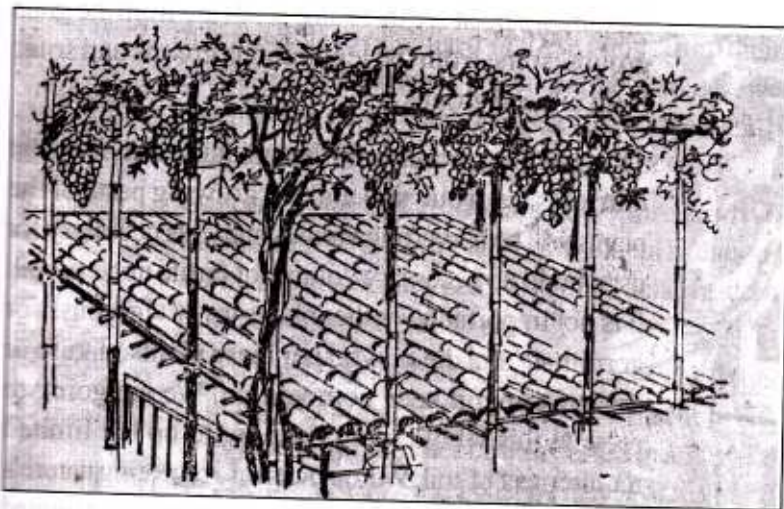
6.5. Soil Building :

1. Small Scale experiments and ventures in some crops must be taken to learn and get enlightened in nature's ways of harvesting assured record yields from these crops.
2. We need to build up a volume of 100 to 160 cubic ft of soil for harvesting 1000 sq. ft. area (1089 sq.ft.) of sunlight.

This sunlight may be falling on land or on roofs and walls of the house or on the terrace of the bungalow -

It is not the land but

the sunlight that is to be harvested !



3. To improve this volume of soil by whole-plant use technique to convert and maintain it as Fertile, Nursery-Soil. With proper insight in whole-plant use technique, we can establish the lost balance in the fertility and in the form and structure of the soil through plant parts available from the farm or from close vicinity of the farm. ...

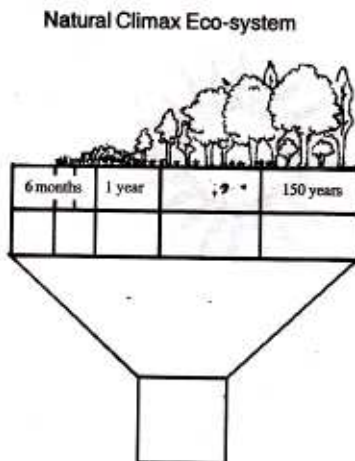
6.6. Wild Farm And Nursery Orchard Phase :

1. The Green Cover :

It is advisable in the first year or two of Home Farming to keep the entire area for harvesting the sun under constant green cover. We must do repeated sowing of a mixture of a variety of seeds of very small size such as mustards, pearl millet various grasses, black grams, flaxseeds, jute seeds etc.

The lesser the carbohydrate content in it the better it will be for the first two or three sowings. Gradually we can take to the sowing of larger seeds like groundnut, beans of various other varieties etc. While preparing a mixture we must see that some seeds are from the grain groups, some from the leguminous groups and some from oil seed groups.

This greening processes will start our search for plant nutrients from our soil and the growing parts of the plants will be harvesting various nutrients necessary for us to build up necessary volume of fertile nursery soil. It is not important whether plants grow vigorously or germinate and die or whether these plants mature or are suffering in keen competition. We are going to recycle this whole biomass to build up the limited requirement of soil. We are in a sense repeating nature's grassland and pasture ecosystem evolution in our limited space.



Nature's Energy Refinery
Condensed in Space & Time :
10 gunthas in 3 years.

Within a period of two to three months one will be ready to start the crop he wants to harvest through this constant greening process. If the local weeds and grasses also appear on the scene, these are the original host plants that know better than the guest seeds sown repeatedly. Unless we raise such greening we will be losing our daily opportunity of harvesting the sunlight that is otherwise lost forever the very night.

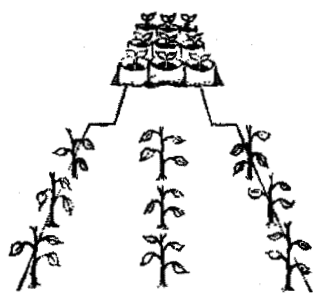
Unharvested Sun means lost opportunity.

2. The Nursery Orchard :

Side by side with greening and with the rapid accumulation of the fertile nursery soil aggregate, one must take to raising nursery plants of different fruits. The reasons are :-

1. Most of the fruit plants need very little volume of nursery soil for ideal growth in the first two years. It is about ten litres per plant in the first year of its growth and maximum forty litres for the second year. Fast growing nursery plants like guava, pomegranate will need about double this amount of soil while sapota, mango, lime, orange plants may require less amount of soil.
2. It is possible to raise most of these plants from their seeds. But if we have to select grafted varieties, we can purchase well established six to twelve month old plants from some reputed nursery nearby.
3. Generally nursery fruit plants take three to five flushes of new growth in a year in Indian situation. So we have a constant sense of added achievement in our budding eco farm.
4. The nursery plants can be raised in movable bags of plastics or polythene; or can be raised in trenches or on heaps and can later be transferred to any place on our farms, on their reaching a canopy area of 10 to 25 sq. feet (with proper indexing of leaves).

5. As most of the plants with index number 10, in their first year of growth will not have cover of canopy area more than three sq. ft. with 100 cubic feet of fertile nursery soil aggregate, one can very well raise at least 320 good size nursery fruit saplings.
6. If we succeed in achieving 3 sq. ft. canopy growth of nursery fruit plants (with index number 10) in the first year, these plants can give one or two good size fruits of total weight about four hundred grams. That is one can start reaping fruits from the very first year. This success will lead to rapid spread of our system of farming amongst the masses who generally believe that fruit plants can yield their first harvest only after four or five years.
7. In the second year of growth, plants will have a larger canopy so that about forty to eighty plants will be harvesting the entire sunlight over 1000 sq. ft. area from the very second year. If the plants reach full canopy of twenty five square feet in the second year, only forty plants can grow in 1000 sq. ft. area while with a canopy of 10 to 15 sq. ft. about eighty plants will be the maximum limit to harvest the Sun on 1000 sq. ft. of land.
8. Our method of keeping nursery plant saplings mobile in the first year of growth has many advantages. As these plants grow with repeated flush at two to four months interval the canopy of the plants increases and spreads rapidly. Thus by keeping proper number of plants in limited space so as to adjust the index number of the canopy, we begin to pump out and reduce entropy from that much part of our farm area. Suppose we have five plants with total canopy of ten sq. feet. If placed in two sq. feet area, these plants will pump out optimum entropy from that area.



Reduction of Entropy per sq. feet.

But if the five plants have canopy 25 sq. feet, the area needed will be five sq. feet. Thus as per the growth of the nursery plants, we can (in our mobile system of nursery plants) begin to enrich the farm ecology more and more at each new flush by giving more and more space for each plant as per its new growth by increasing the original spacing amongst these plants.

The remaining other 240 to 280 one year nursery plants can very well be used to cover about three to seven thousand sq.ft. of land with green cover. A new exchange and barter type of sharing will then induce further networking in the other neighboring households. The neighbours on looking at the success of our first year growth, may be expected to come seeking to use these methods and will participate in accumulating enough fertile nursery soil volume for raising these fruit plants.

9. Most of the fruit plants in close nursery plantation have only a limited need of water and by creating proper microclimate through some nearby shade plants or by a temporary artificial shade, this need can be further decreased.
10. The growth of every new flush helps us to understand the fertility status of the soil in which the plant is growing and so one can begin improving it at the earliest.

Moreover as the plant grows and gains its ultimate size (say ten to twenty five sq.ft.) then the yearly droppings of the plant parts can be recycled and most of the nutrient needs and the maintenance of nursery profile of the soil will be locally met. In fully grown seedless variety of grapes, only sugar and organic pulp of the fruit is sent to the market and very little of micronutrients are in the fruits since they are seedless.

Natural Microclimate control - refer pages 156-157.

Figorous experiments in Grape cultivation without any external fertilizer inputs by Mr. Ganapatrao Maitre , Tasgaon Dist. Sangli Maharashtra India.

Details of the whole plantation are available.



Therefore only the complete recycling of the cuttings of the prunings, has now mostly eliminated the need of yearly composting and manuring operations in well established grape gardens.

This new vision in Natueco Culture of grapes has now changed the entire picture of grape cultivation in Maharashtra.

3. Some Interesting Studies :

To understand the real importance of the observations given above let us take some other examples. Some fruit plants like grapes, pomegranate can continue their growth more vigorously than the fruit plants like lime, mango, etc. The fast growing plants can therefore achieve a canopy level of 25 or 50 sq.ft. in a period of one year while a mango plant can reach at the most ten square feet of canopy area in the first year of its growth capable of harvesting only one sq. ft. of sunlight as the index number of mango leaves is ten. If the plant growth is kept vigorous through fertile nursery soil provisions from second year onwards the growth will be ten times, i.e., it will attain a canopy capable of harvesting sunlight from an area of ten sq.ft. in the second year.

In the third year it will be about six to eight times this growth (as the stems of the plants are thickening now some growth is transferred to this part) i.e. at the end of third year of its growth a good mango plant will reach a canopy capable of harvesting sunlight from an area of sixty to eighty sq. ft. and on the fourth year reach a canopy four times this, i.e., about 240 to 320 sq. ft. to harvest fully the sunlight falling on this area.

Mangoes, lemons, oranges are called evergreen plants as they keep their canopy evergreen throughout the life cycle. While pomegranate, custard apple, guava, grapes are deciduous plants as these plants can survive without leaves in severe conditions of temperature and moisture. By having a variety of these nursery plants for proper raising one can learn many of nature's ways of raising the jungles and forests with bushes, shrubs, small trees and trees of enormous size. Let us try to learn more of this scheme through some interesting studies.

1. Mango Plant Growth :

1. In nature's scheme every tree is a colony of newly growing units. Thus though there are many branches and subbranches, each growth of new shoots in a single season can be treated as a separate entity than the whole plant. So if there are twenty new shoots, there are twenty new establishments as separate units.
2. Let us start with a mango graft of six month age with ten leaves to it, on a single grafted shoot.
3. On reaching maturity after first period of growth these leaves will begin harvesting the sun.
4. If the plant is helped at this time to get new flush, the food conserved will be used in this new growth.

But to have this growth the soil must be fertile enough to provide all necessary mineral nutrients needed for new growth and the soil should have ideal structure so that at the time of new growth there will be simultaneous new lush growth of roots in it.

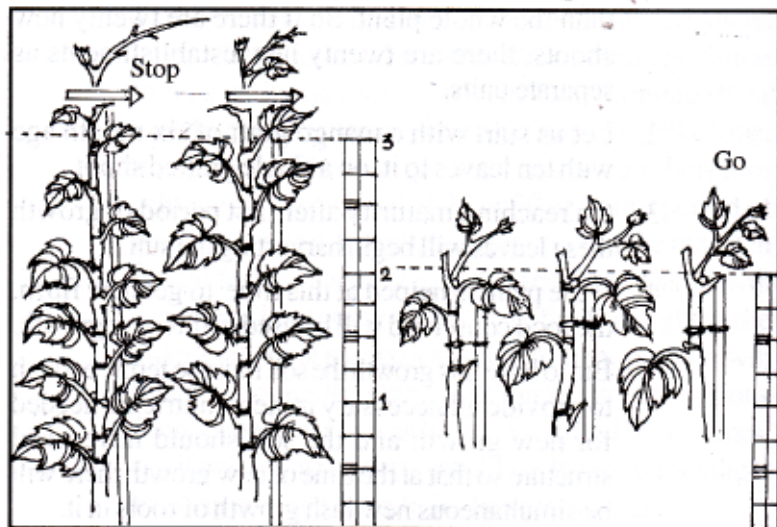
Various critical details available as printouts.

Correspondence studies available.

5. In nature's second scheme of growth this new growth will be in multiples and instead of growing only a single new shoot the plant will have two to four new shoots at the top of old shoots in every new flush.
6. Supposing, with a modest rate of growth, the growth doubling at each stage and taking minimum three flushes in a year, the original growth will be with two more shoots in the first flush; to each of these again two, so four more shoots in the second flush; eight more shoots in the third flush; so the total number of shoots after this last flush will be $8 + 4 + 2 + 1 = 15$ and if on the average each shoot has eight leaves the total number of leaves will be 120 at the end of first year.
7. The area of about ten leaves of mango is about one sq.ft. So the total area of the leaves will be 12 sq.ft. The Index no of mango leaves is ten. So the plant is now capable of harvesting 1.2 sq.ft. of sun light.

2. Grape Vines :

1. When vines like grapes start spreading they can continue to grow unhampered for three or four months. Generally the area of three well grown leaves is about one sq.ft. and by the technique of repeated branching through top part removal after





Prayog parivar experiments with Small grape farmers.



The first team of experimenters at Tasgaon celebrating publication of laser copy of 'Plenty for All.'



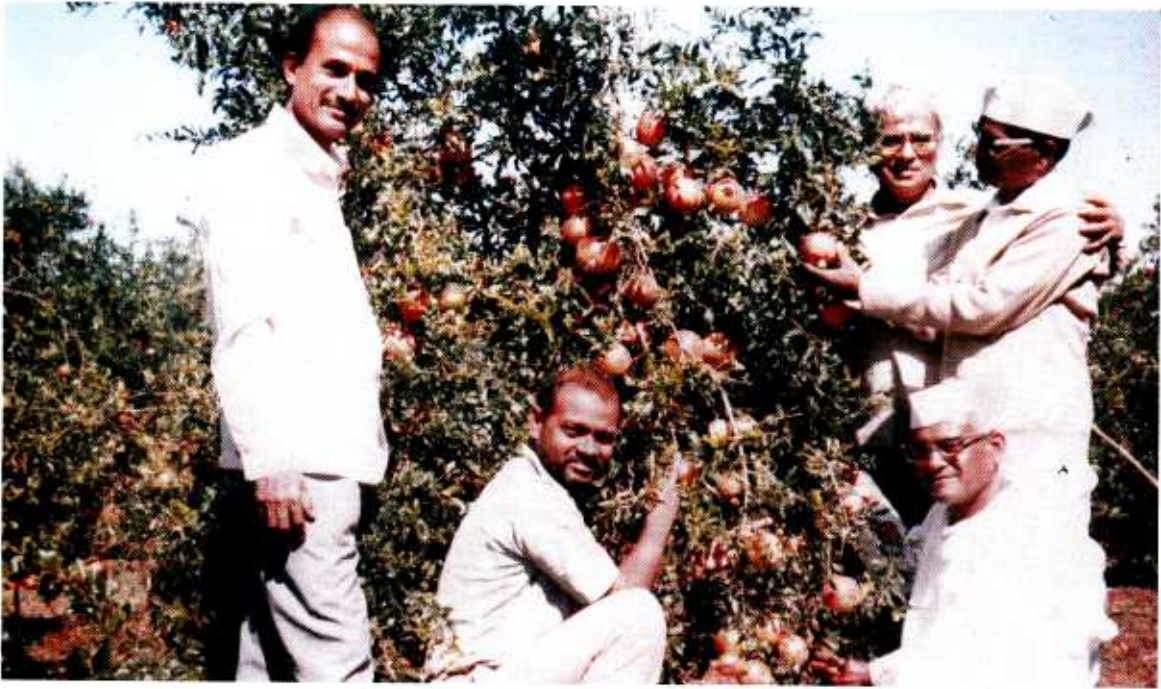
Sweet potatoes in 1 sq.ft area.



Study of potted roots (Okhra) in 2 ltrs. soil.



Study of Banana roots in 16 ltrs. soil.



Bumper crop of pomegranate plantation. Age 2 years.



250 Lemons every year on the terrace.



Record Maize crop in measured soil.



Mobile mango fruit plantation technique.



Explaining concept of leaf index no. to Shri Thakurdas Bang & Sarva Seva Sangh Group.



Dr. R. T. Doshi's City Farming Experiments on 1000 sq. ft. terrace at Bombay.



Age of the plant 2 years, spread 10 sq. feet, variety Chandramukhi.



Age of the plant 2 years, spread 10 sq. feet, variety Alphonso.



Age of the plant 3 years, spread 60 sq. feet.



Successful close plantation in stone pits (4th year crop)



Grape cultivation without any external fertilizer input.
(Symbiotic combination of Gliricidia, Himata etc.) (Record crop in the first year)



Study of Grape root system

every fifteen to twenty one days - called the stop and go technique -we can increase the canopy of the grape vine multifold in a very short span of time.

2. The growing branch of a grape vine daily adds one new leaf in the growth. So in fifteen days period the growth is of about fifteen leaves and, out of these, five leaves at the top are removed to get good branching. Now as the index number of grape leaves is about three, in the first growth the real canopy growth will be of one sq.ft.

In the next fifteen days it will be doubled again to be subsequently doubled in the next fifteen days and so the total canopy growth will be (1 + 2 + 4 + 8 + 16 = 31) thirty one sq.ft. by the end of seventy five days of its new growth.

Next the leaves of grapes mature in about 35 to 40 days on its emergence. So this whole new growth of the vine will build up a good reserve of food in the next three to four months before next pruning to harvest the first crop of grapes.

The success of the scientific grape revolution in Maharashtra is mainly due to the understanding of Nature's stop and go growth pattern of grapes. With this techniracy, the grape growers are now reaping full crop in the very first year of plantation with record yield of 400 gm per sq.ft. canopy developed to harvest the sun.

They now easily reap 16 tons of crop in one acre of land in the very first year.

Elsewhere in the world the first full crop is taken in the third year. Knowing nature's ways of helping plants to grow fast, our experimenting enterprising farmers have evolved the new scientific technique called stop and go technique.

Study of grape roots in inverted pot system.



With this technique and the basic understanding of the principles of harvesting the sun, our grape growers create situations favourable for nature to take full scope in bringing out the latent capacities in the grape plant at the earliest.

Fruit plants like pomegranate or guava have a continuous growth period in every flush and these can be also grown fast on lines similar to grapes so as to cover large canopy of ten to forty sq.ft. even in a single year growth. But plants like mangoes, lemons, sapota have very limited growth with limited leaves emerging at every flush and hence cannot cover more than one to three sq.ft. of canopy area in their first year growth.

The establishment of proper hedge and fence as a protection to our farms can be achieved with pre-planning by following these techniques of mobile nursery fruit plant raising, for necessary groups of bushes and shrubs to be planted later as hedge plants.

The second phase of wild farm nursery orchard in our Home Farming has thus a great content of knowledge.

Multi-level use of resource.

- Fence as fence
- as tree
- as fruit
- as fuel & energy
- as fodder
- as fertilizer

Next with the experience gained in learning and mastering these skills we can now proceed to the study of the third phase of further enrichment and enhancement of home farm resources.

6.7. Steady Yearly Returns -

1. A New Alliance :

The progress and success of our activities in phase two begin to foster a close alliance between our farm and nature. Within a period of four to eight months a new fertile mass of nursery soil accumulates in sufficient amount.

Some of this soil is used for rearing nursery orchard plants. The remaining soil can be best put to use for raising various useful plants for steady yearly returns (In cash or kind or in both) The layout given below may change from place to place but the main emphasis of this phase will be to raise and establish more or less a steady fresh supply of Sugars, Starch, Fruits and a good provision of cellulosic and lignin type fibre material throughout the year for preparing mulch and additional humus and lignoprotein to further improve the form and structure of our soil.

Various case studies available

2. Root Crops :

Root Crops like sweet potato, elephant foot, yam group of roots, tapioca etc. can easily yield crop of one kg. per sq. foot of sunlight harvested in four months. These Crops can flourish even in virgin soils and with scientific insight of providing proper amount of degraded biomass mix to these plants and with handful of ash once or twice in the last phase of their growth can improve the quality as well quantity of the roots.

These roots when dug create a sense of abundance and achievement as also these can be preserved without digging or on digging preserved and used throughout the year and various delicious dishes could be made with these. Moreover these are highly nutritious and can be added in animal mash to increase milk yields. Two hundred Sq. feet of area of this crop in a period of eight month can thus build a substantial reserve of starch.

We can also bring this area later under cultivation of pulses to increase its fertility and to have overlapping canopy of pole beans etc. to harvest the sun more. Under the semi shadow of these crops we can also take crops of ginger and turmeric through proper overlapping canopy management techniques.

3. The Sugarcane Pits :

The pit method of raising sugarcane is found advantageous in many ways. Pits at a distance of 8 feet and of size 3' x 3' x 1.5' (about 12.5 Cu. ft. of soil) can raise a crop of about seventy good size (2.5 Kg weight) sugarcanes. The scientific principles to achieve this success are easy to grasp and follow. Five such well established pits can establish a permanent stand of about 350 Sugarcanes on our farm. Our plantation of canes in each pits will be done with a gap of two months each, so a ready crop for crushing of cane will be available on every day of the year. A cane of weight 2.5 Kg. will yield garden fresh 1.5 liters of juice more than needed by a family of five. If processed and preserved four or five canes of weight ten Kg. can yield about one kg of gur or raw Sugar.

Thus a maximum area of about 300 sq. ft. will make a provision of 50 to 60 Kg of gur per year. Instead of gur, gur syrup will be another good product. .

In the first two or three years' period green manure crops will be raised in between the open space available between the pits before the canopy of the canes cover that area.

But still in the last phase of growth of the canes we can raise pole beans to harvest the canopy sun as with aging that canopy of the canes will be less functional. The pole beans will also provide nitrogen through their nodules for the next sugarcane crop.

The parts of the crushed canes will be recycled in the same pits so the mineral nutrient level is maintained and ratoon crops can be raised for years together in the same pits. Successful sugarcane ratoon of more than fifteen years are taken by some farmers in our state and in the nearby states too.

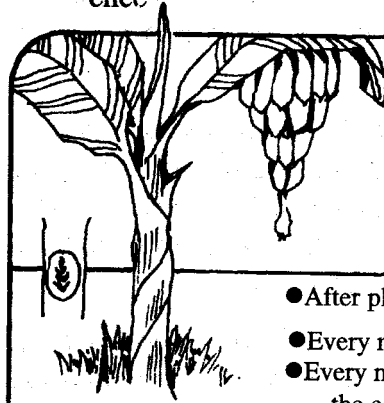
4. Banana Fruit Bunch Each Month :

With the increased accumulation of fertile nursery soil aggregate we will begin bi-monthly plantation of banana shoots. With plantation of two shoots in every alternate month in a year we will have a set of twelve banana plants of different growth stages. One will then learn the growth pattern that after new plantation, the coming of every new leaf should be at least one and half the size of the previous leaf till the regular leaf size of about 12 to 15 sq.ft. is attained. Thus if the first leaf emerging after new plantations is of the size of 1 sq.ft. the second leaf should be of the size 1.5 sq.ft. the third 2.25 sq.ft. and so the eighth or the tenth leaf should be of the size 12 to 15 sq.ft. This insight in growth will help one to optimise the leaf index at the earliest to have record yield of the bunch.

Various case studies available

Component 4
ence

Learn the new Science



In 13 months you can get assured yield of 30 kgs. of a banana bunch on every banana tree in your backyard.

- After planting banana in 25 sq. ft. space,
- Every month it will grow three leaves.
- Every new leaf will be one half times the earlier one.

● Accordingly, the faster the leaves grow of full size (4' x 2') the better will be the banana yield.

● The life of banana leaves is five months.

● After 5 months, the first leaf will die, new one will grow.

● The banana tree will always have 15 leaves only, hence learn to grow the leaves in the right ratio in the first 5 months itself.

● Neighbourhood waste can easily provide the fertilizer in form of cowdung, ash, dried and rotting leaves, oil cakes, and wastemud.

● The banana flower is formed at the end of four months and emerges in the ninth month.

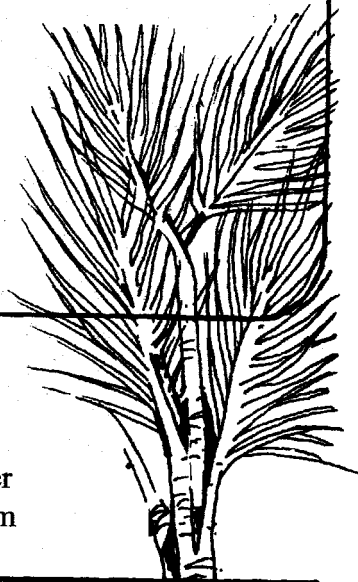
Summary

3 months - 3 leaves in 1.5 ratio

4 months - 27 leaves within

5 to 7 months - Develop ample roots and girth diameter.

9 months - Banana develops well.



Likewise, using the same technique, grow coconuts, with 10 litre water and obtain yields of 300 nuts from the sixth year onwards.

Generally these plants are planted keeping a distance of five to six feet between them, as per variety and barring some effect of seasons, the first crop will be harvested after thirteen to sixteenth month of plantation. Then onwards a regular crop of one bunch of size 30 to 40 kg can be harvested monthly. As with sugarcane these can be inter cropped with some leguminous crops to help the next ratoon crop as well to maximise sun harvesting.

More over the recycling of the plant remains will preserve the mineral nutrient level of each pit in each new cropping. So also the humus and other soil structure improving parts of the soil will also go on adding in each process of recycling. We will be establishing on our farms nature's methods of building and improving soils through gaining more and more experimental insight and know-how. A new allegiance will thus gradually grow between our farms and nature.

Case studies available

5. Other Fibre Yielding Plants :

In home farming layout one coconut plant (area required 250 to 400 sq.ft.) and one or two bamboo clumps, (area required 75 to 100 sq.ft. per clump) must find place wherever it is possible. These plants as with our previous sugarcane and banana plantation can also thrive on whatever family waste water is available. All these plants are best adapted to bathroom and kitchen room waste water. As the growth of bamboo clump and coconut plant will take at least four to five years, these can very well be planted on the area allotted to root crops or with inter spacing of sugarcane or banana crop.

Experiments conducted in
nursery plants of sorghum at
Jana Seva Mandal,
Nandurbar.



All the waste of coconut and bamboo on proper decomposition in situ add to the biomass component of the nursery soil. And this lignoprotein component is more steady than the humus component of the other bio-degraded material. The only condition for good turnover is to decompose these parts in heaps after flaking or powdering or beating or softening and never allowing these to decompose anaerobically.

6. The Grain Crop :

To get record yield and record harvesting of the sun the following techniques were gradually standardised.

1. Nursery plants of all grain crops are raised continuously throughout the year. Each grain crop as per its total life span has about one fifth of its total life as its nursery stage. In this stage it is advantageous to have the growth in limited soil with high level of total mineral nutrient content in it. We can raise such nurseries in pits, in pots, in baskets, in hills, in bags (paper or polythene) in earthen balls, leaf cups etc. These can also be raised in a specially prepared nursery bed of 4" to 6" height.



Successful staggered
plantation of the grain crop.

All the bags etc. will be also of small size, holding one half to one litre of very fertile humus containing nursery soil. In a period of twenty to thirty days the ball of white roots with lush growth will be visible to each plantlet.

2. Replantation of selected vigorous grain plants with proper insight in their final spread will be done when the first phase of their growth is about to end. This slight shock makes the plants growing at new places more sturdy and vigorous and the internodes of the plants begin to expand in sequence within ten days of replantation.

So also tillering, if any, (as in rice) is also over by this period and the small size of leaves of the plants in the nursery stage begin to enlarge and take their full size in sequence. Thus we can maintain vigorous uniform stand of required plants, and with proper amount of nursery soil, added near the root of every plant we can hasten the establishment of a new rootmat inside the transplanted soil. Such growth of roots is very important to make good, thick growth of every internode to become a good storage organ to store the food processed by the mature leaves of the plant which is later used for grain filling.

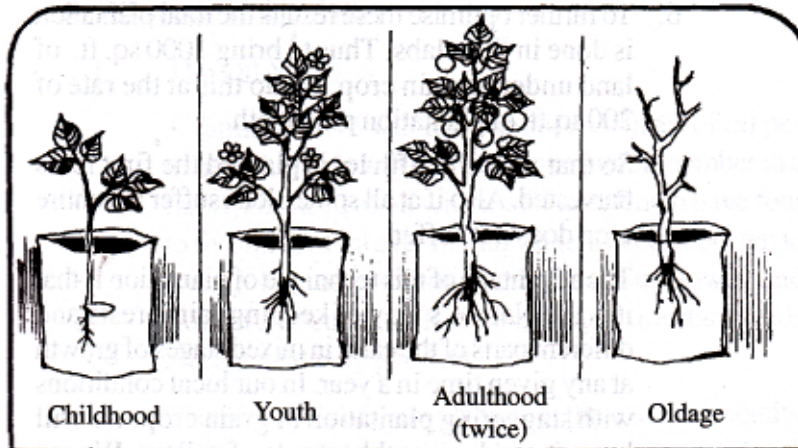
More information on the 5 stages of plant growth and its life cycle is available for different plants.

3. Simultaneously with this node formation stage panicle formation stage starts at the end of this stage of growth. This stage of panicle formation starts at the end of second stage of 5 stages (2/5 stage) of growth of crop and ends at the end of 3/5 stage.
4. The emergence of the panicle and the flowering takes place in the next one fifth period of growth and in the last one fifth stage of its growth the seeds mature and the plant dies.
5. Thus every grain crop has five stages of growth:
 1. Nursery stage.
 2. Tillering (if any) and internode elongation stage.
 3. Panicle initiation and internal growth stage of spikelet formation.
 4. Panicle emergence and flowering stage.
 5. Grain formation, grain growth, grain filling and maturation stage.

To sum up, our new technique of raising nursery plants of each grain type, assures us to have well nursed vigorous plants grown in a very limited volume of soil but taking care to see that each nursery plant has full good mineral nutrition and vigorous root zone before replantation.

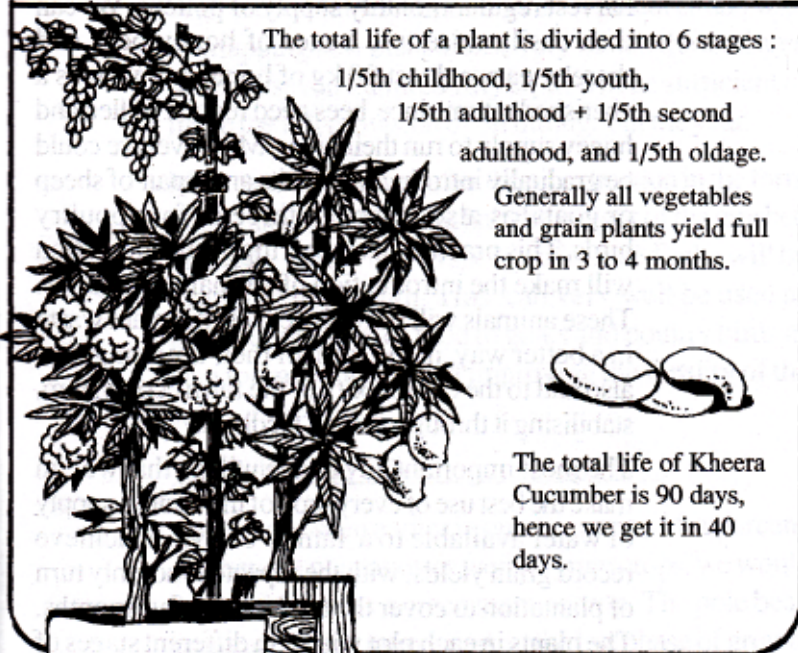
The age at which the plant can do optimum sun harvesting starts when the first internodes begin to elongate. By replanting the nursery plants to get the plants re-established for this harvesting we are ensuring optimum use of sunlight. Otherwise if we had sown the seeds in the farm directly, most of the sun light in the farm cannot be harvested as the leaves are small and also immature in their first phase of growth.

Moreover the nursery soil provided near each root zone of the plant assures good growth of the storage organ in the internodes as the new outgrowth of the roots of the replanted plants in humus will keep the level of cytokinin of the growing plant high.



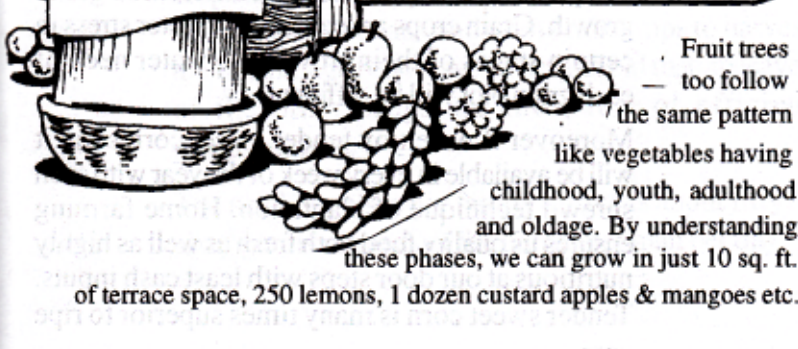
The total life of a plant is divided into 6 stages :
 1/5th childhood, 1/5th youth,
 1/5th adulthood + 1/5th second
 adulthood, and 1/5th oldage.

Generally all vegetables
 and grain plants yield full
 crop in 3 to 4 months.



The total life of Kheera
 Cucumber is 90 days,
 hence we get it in 40
 days.

Fruit trees
 — too follow
 the same pattern
 like vegetables having
 childhood, youth, adulthood
 and oldage. By understanding
 these phases, we can grow in just 10 sq. ft.
 of terrace space, 250 lemons, 1 dozen custard apples & mangoes etc.



6. To further optimise these results the total plantation is done in five slabs. Thus to bring 1000 sq. ft. of land under a grain crop, we do this at the rate of 200 sq.ft. of plantation per month.

So that after the fifth lot is planted the first lot is harvested. Also if at all some plots, suffer the entire crop does not suffer.

The advantage of this technique of plantation is that it is the Nature's way of keeping rainforests and different parts of the earth in mixed stages of growth at any given time in a year. In our local conditions with staggering plantation of grain crop, we will harvest regular monthly supply of pollens. We can then easily raise two boxes of honey bees and thereby earn at least 20 kg of honey per year as a cherished return since bees need regular pollen and honey supply to run their hives. Moreover we could be gradually introducing rabbits and a pair of sheep or goats, as also a pack of three or four poultry birds. This practice of staggering grain cultivation will make the introduction of animals easy for us. These animals will not only recycle the plant waste in a better way, in the form of their droppings but also add to the complexity of the farm eco-system, stabilising it through mutual feedback.

The most important advantage will be that we can make the best use of every drop of the limited supply of water available to a family of five to achieve record grain yields, with the repeated monthly turn of plantation to cover the total area in five months. The plants in each plot will be in different stages of growth. Grain crops are sensitive to water stress in certain stages of their growth. So water need of each grain plot will be different.

Moreover if we enjoy tender sweet corn soup it will be available in every week of the year with such shrewd technique of plantation. Home farming ensures us quality food both fresh as well as highly nutritious at our door steps with least cash inputs. Tender sweet corn is many times superior to ripe corn.

6.8. Oil seeds and pulses :

1. The Oil Seeds :

A family of five will need about five litres of oil per month. As there will be at least one junior member in a family the need of oil will be still less. But to have four to five litres of oil ever month we will need about ten to twelve kgs of groundnut oilseeds. Sunflower and safflower seeds as well as flax, sesame, mustard seeds all can yield very good oil.

The life - cycle of these plants is of three to four months. With successful scientific cultivation practices and with overlapping new plantations every month the total area of about seven hundred fifty sq.ft. will be sufficient to make the full provision of oil throughout the year.

Moreover the remains after the oil extraction in the form of oil cakes will be about half the weight of the crushed oil seeds. About five to six kgs of oil seed cake will be available per month. This can very well be used as good supplement of food to goats and poultry birds as also for maintaining and improving the fertility of the soil.

2. The Pulses and Other Leguminous Plants :

As we have seen earlier in our discussion of sugarcane and banana plantation as well as grain crops, we would grow this crop as a green manure crop. The pole bean crop can also be introduced, in the last phase of growth of sugarcane, banana and even grain crops to harvest the sun through bean leaves when the old mature leaves of the other crops are incapable of efficient photosynthesis.

The need of pulses per family of five is about fifty to sixty grams of seeds of the pulses per man per day.

When we add poultry, goat, goatmeat and milk this need will be still reduced. But presently with these figures a family of five will need about eight to ten kgs of these seeds per month.

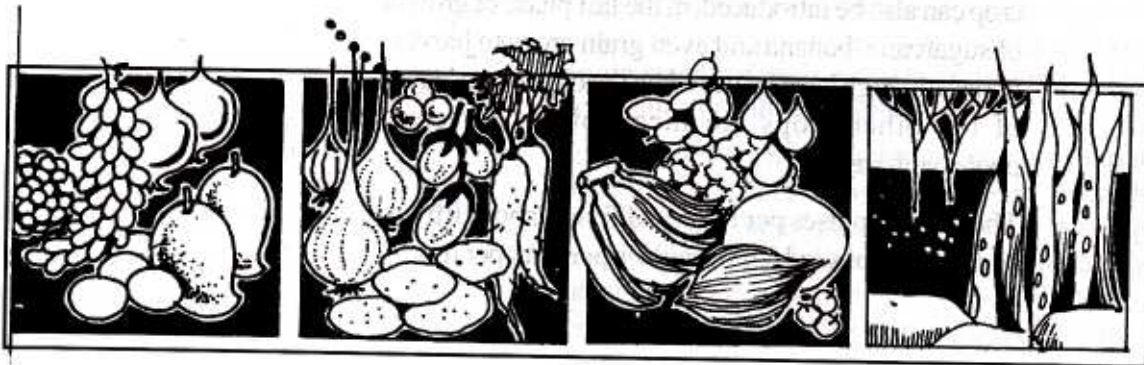
The area to be kept under cultivation by the monthly sowing chain will be about seven hundred and fifty sq.ft. This much area will be sufficient to build up enough stock of pulses for a family. The average good crop of soyabeans, groundnuts, that provide both oils and high rich proteins is one kg of seed per twenty sq.ft. of area. Most of the leguminous pods are eaten green and these provide better rich proteins.

Our plantation of grains, oilseeds and pulses will follow in succession in each plot so the effect of this rotation will help to maintain the fertility of our soil throughout the year.

9. Phase Six-Vegetables, Spices and Ornamental plants.

Various vegetables and spices like turmeric, chilies, ginger can be very well grown as short term intercrops or as shade loving plants. Mostly these can be grown near the Farm house to harvest the sunlight on roofs, walls and terraces of the house.

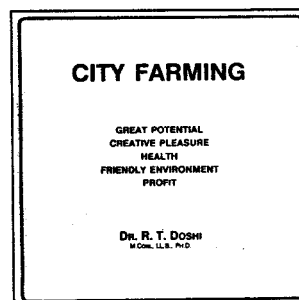
The concept of terrace farming, in accordance to the Prayog Pariwar approach, is now becoming popular in various big cities.



As the returns are very attractive, the pioneer in this experiment, Shri.R.T.Doshi has brought out a book titled City Farming to narrate his experiments. He has summed up the results in following words -

1. Great potential.
2. Creative Pleasure.
3. Health.
4. Friendly Environment.
5. Profit.

Our Home Farming through the new approach of nature-knowing (scientific)-farming will not only fulfill all these promises but also many other promises contained in various “F” s - Food, Fuel, Fodder, Fertiliser, Fibre, Farm-Forest, Fish, Flesh (poultry, goat and pond fish), Free (unhindered) knowledge, Farm house, Farm reservoirs, Farm shade, Free time and Freedom (leisure for better and fuller expression in life).



10. Phase Seven - “Farm Reservoirs” :

1. Daily Family Need of Water :

The water requirement per family of five is minimum hundred litres per individual per day that comes to about 500 litres a day or 1000 litres per two days. Now 1000 litres of water is one cubic meter (One M³) of water. So the total minimum need of a family per year will be 180 M³ to 200 M³ of water.

Generally water supply of most of our villages is hard hit for three to four months in the summer season. This water requirement is about 60 M³ for four months. Great amount of energy and government machinery and time is expended to make these provisions at various odd places in the countryside. But hardly anyone has thought of in situ conservation of at least this much water per family to tide over its summer water problems.

Prayog Pariwar is now adding a new dimension of “Natueco Culture” to recycle the family daily waste water (one half cubic meter) to raise various crops in a six to eight thousand sq ft. area.

Various schemes are under study

If we analyse the daily need of water of plants we gather the following scientific facts :

2. The real need of water for a plant:

1. Water is needed to build up dry matter which is nearly sixty percent of the total dry weight. Thus any crop standing in one guntha and processing optimum dry matter per day will need about 2.4 litres of water as per day accumulation of dry matter per guntha is about 4000 gms or four kgs.

2. Water is needed by plants to take nutrients from the soil. They take these nutrients by ionic exchange.

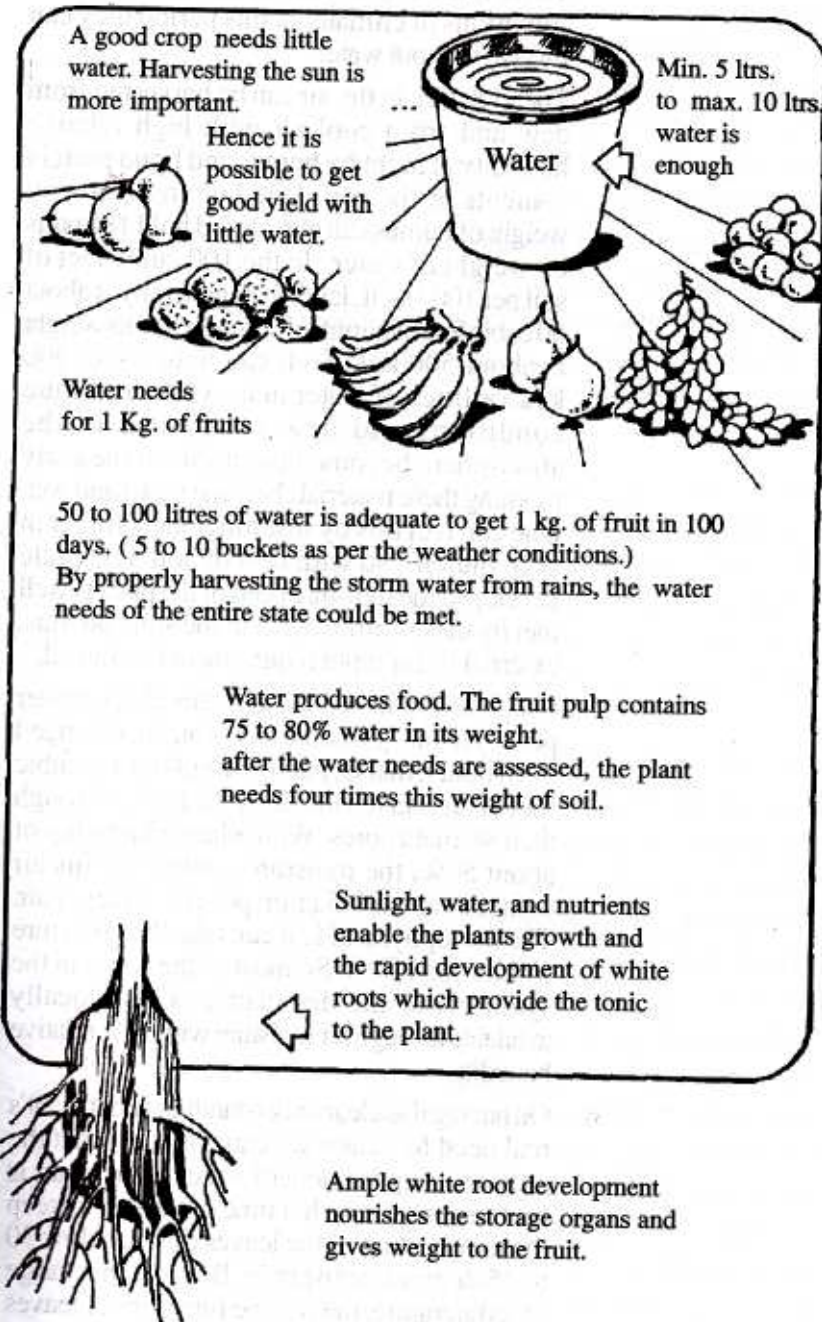
This ionic exchange takes place between the roots and soil by give and take method (plant gives one hydrogen ion to soil and then soil exchanges one potash ion to the plant) depending on the valency of the ion. For this only a very thin, film of water is needed in the soil particles near the roots.

3. Most parts of the plants body especially of trees are dead. The wood and the bark of the tree is of dead tissues. The newly formed xylem (zone of vessels taking nutrients from roots to the leaves of the plant) tissues in each cycle of periodic growth are dead after one and half month. Only the cambium, the phloem zone of a few mm thickness and the cells of the green leaves and parts of flowers and fruits are living tissues that need water.

4. With new flush of growth some burning of stored food in respiration takes place. In respiration, in the breakdown of carbohydrates, water molecules are released and these can be recycled as is the case with desert animals. Desert animals can get water by burning stored fat in their body in times of scarcity.

One should test these details by experimenting on one's own.

Component Water for plants



This is your space to raise questions and take notes.

5. Some fruit plants, shrubs and bushes are deciduous in nature. These plants shed their leaves and become dormant in unfavourable conditions of climate. In this period they can survive without water.
6. The moisture in the air can be harvested from dew and from cool air with high relative humidity at night by humus and ligno protein contents of the soil. One hundred parts by weight of humus can absorb and hold 181 parts by weight of water. In the 100 cubic feet of soil per 1000 sq. ft. land, their generally is about 50 cubic feet of humified compost and its weight is about 500 kgs. So it can hold about 900 kgs. or litres of water in it. As the moisture conditions and dew conditions in the atmosphere become favourable in the early morning these materials become moist and wet. One can feel this by inserting one's finger in such mulch. So with best of soil aggregate developed the moisture need of the plant is well met by these components in the soil and thus, external water input requirement is reduced.
7. For photosynthesis of four grams of dry matter per day about 900 cubic feet of air is exchanged in 10 hours, that is, per minute about 1.5 cubic foot of air is taken inside by the leaves through their stomata pores. With relative humidity of about 50%, the moisture content of this air comes to about 0.5 gram per cubic feet of air. The mesophylls of leaf can take this moisture by blotting effect. So most of the water in the synthesis of the dry matter is also locally available through air moisture with 50% relative humidity.
8. On having this clear understanding about plant's real need for water we can conclude that the only real requirement of water to the plant is for transpiration in hot time of the day to keep the temperature of the leaves down, below 30 to 35 degrees centigrade. Beyond this range of temperature, the routine functions of leaves are affected.

But there are various ways to estimate these rising temperatures and to lower down the temperature of leaves by 15°C at noon time (to keep it at about 30°C) through the cooling effect due to the moisture transpired by the leaves. For this it can be shown that 100 milliliter of water will per day will be sufficient per fifty sq.ft. of canopy area of the plant. Transpiration of one milliliter of water removes about 600 calories of heat from the leaves, that can cool down 60 milliliter of water in the leaves, by 10°C . The canopy of plants in about fifty sq.ft. of area at the most, content 6 litres (kg.) of water in its fresh weight.

This is the space for critical notes taking.

9. Big evergreen trees like mango, Tamarind can create their own micro climate. The need of water for transpiration is further reduced due to such micro climate creation. The evaporation of water from the soil can also be well prevented by ligno protein and proper mulch cover.

On grasping these facts regarding real water requirements of plants we judge that the daily waste-water from a household of a family of 5, of about $0.5\text{ M}^3 = 500$ litres will be more than sufficient to supply the water needed by 6000 sq. ft. farm. Moreover the nursery plants need very little water and the old dying plants also need very little water (in the final ten to fifteen days of their maturity period). Hence, the same 0.5 M^3 water will suffice, in the 5 slab system, for 8000 sq. ft. land. We have emphasized monthly repeated planting of grain, oil seed and pulses plantation to have better and fair management of the scarce available waste water of one half cube meter a day (i.e. 500 litres a day).

3. The Biomass Potential :

With such deep insight in water use by plants it can be seen that the available waste water of about 500 litres will be enough to raise and maintain an 8000 sq. ft. of plantation of different crops. We can list these crops as required by the various needs of the family of five, as :

1.	Greening and nursery orchard plants :		2000 sq. ft.
2.	Root crops and a coconut plant :		250 sq.ft.
	Banana Plants (12)	300 sq.ft.	
	Sugarcane 300 canes	300 sq.ft.	
	Two bamboo clumps	<u>150 sq.ft.</u>	
			1000 sq. ft.
3.	Grain crops		1500 sq. ft.
4.	Oil seeds	750 sq. ft.	
	Pulses	<u>750 sq. ft.</u>	
			1500 sq. ft.
5.	Mulberry plantation for sericulture	500 sq. ft.	
	Other shrubs, bushes as for age plant and fuel & small timber plants.	<u>1500 sq. ft.</u>	
			<u>2000 sq. ft.</u>
6.	Total area required for agriculture		8000 sq. ft.
7.	Residential Farm House & Farm reservoir		2000 sq. ft.
	TOTAL		<u>10000 sq. ft.</u>

With a provision of 500 litres of water per day to this 10000 sq. ft. land of the farm, we can harvest with our mixed green canopy of leaves on it. On an average, 25-30 kgs of dry matter per day from the sunlight falling on this area. No one so far has thought of this great potential of waste water use. The water needed for regeneration of any 10,000 sq. ft. of waste land as a Home Farming unit, just matches the daily fair requirement of the water for a family of five. Any cost that is incurred for building required water reservoirs (in cash or in energy units), will be fully recovered in a period of three years (as in the first year of growth the canopy belt will not cover the entire area so, the returns will be somehow low).

4. The Reservoirs :

It will be advisable to build three or four reservoirs at different places in different plots. The size of each of these reservoirs will be about 50 to 60 cu. meters. That is 5 meter by 5 meter and one meter or 1.5 meter deep and one meter or 0.5 meter above ground will be the requirements. We are now studying various new techniques (of lateral thinking and not of routine thinking) to minimise the cost and to get these filled from the local rains (with or without run off water of the showers). Out of these reservoirs one will be reserved for the summer time provisions only.

5. Pearl Valley Experiments :

With this permanent provision of water we are further hopeful of starting aquaculture also in line with the Pearl Valley Experiments in China. With new Israeli techniques we further hope to harvest one kg of fish per cubic meter of water properly recycled to get it oxygenated and also to harvest different algae crops to feed the fishes.

The full details are available.

However this will encourage in having a big farm pond of the size six to ten meters by six to ten meters by four meters. The grape farmers from the drought prone area of Maharashtra are now going for still larger ponds to eliminate the daily need of one tanker of water per acre, now brought from a distance of 30-40.kms. When we are sure of record biomass returns and of the market this new concept of farm reservoirs or farm ponds is not at all a fancy proposal.

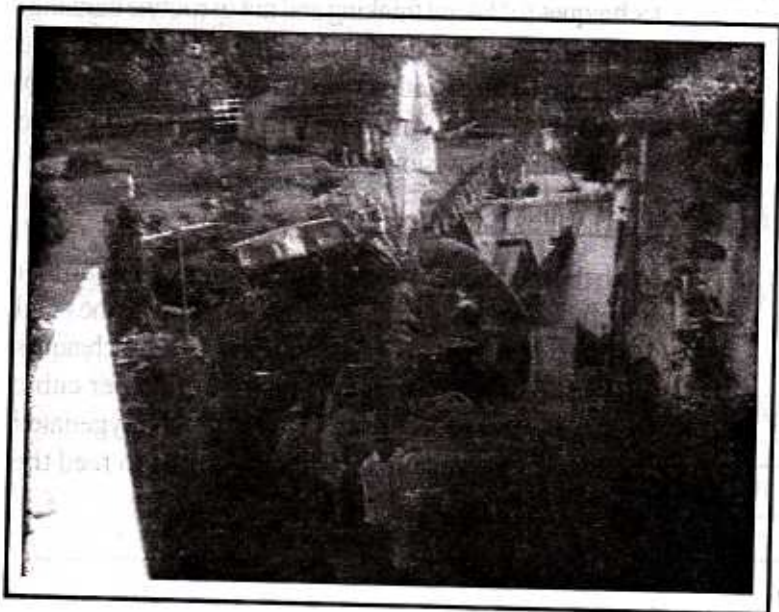
Many farms have by now their temporary farm ponds to collect and preserve rain water to give one or two watering to the crop, when the rains fail. This was the practice in Maharashtra's rice growing parts some 8 years ago. It is getting revived.

6.11. Microclimate Cultivation :

If we opt for nature's ways of evolution we find that the warm blooded animals have now dominated the ecological system as they can survive more efficiently in more harsh environment by creating and maintaining their own microclimate conditions. With the new approach of Home Farming, most of the family needs will be met from the farm itself.

Natural Microclimate cultivation matches the various light levels created by tree canopies and the varied requirements of sunlight of different plants on the terrace.. Even in polyhouses this approach can be used to advantage instead of present polyhouse monocultures.

In Nature's ecosystem, equatorial rainforest is a highly knitted, well poised and enriched ecosystem, existing in the multi-tier zones and territories. On the otherhand, in deserts, it has shown oasis building. Similarly for tundra and other regions.



By keeping a small part of it as a greenhouse corner, that will need very little external energy to run it, we can cultivate many fruits and vegetables that prefer very hot or very cold climate. The energy cost of this system will be many times less than that of running cold storages. Naturally in the near future, these energy inputs for polyhouse techniques are going to make the cold storage systems redundant. Then garden fresh fruits and vegetables, pond fresh fish and oven fresh food will be available for all of us. The coming age is going to be an age of microclimate cultivation as by harvesting the local sun energy, it will be possible to maintain some corner of our farm for glass house technology or still simpler technologies followed for ages by the betel leaf growers all over India.

This crop needs moist shady environment for good production and farmers create this type of climate by proper plantation and maintenance of shade plants.

6.12. The farm house, the farm shade and open space :

We have by now standardised the construction of a two storeyed building (environmentally and architecturally more pleasant and attractive) from small timber wood grown from 2000 sq. ft. of land.

Thus within a period of five years, construction of a permanent fence will be raised from various types of small timber jungle wood growing around the farm.

The construction of farm house and farm shade will not hinder us from harvesting the sun in the vicinity of the house and on rooftops of the house. Various new techniques of City Farming that we have mentioned elsewhere will be improved with more participatory research fitting to the cultural and ecological background of the habitat.

With deeper and deeper insight into the scientific principles of ecological farming and with more experiments and experience gathering in Home Farming, a new style of living will get rooted in the coming twenty first century's history of mankind. Homestead Wealth for all, is to be the clear promise of the coming scientific era in the next century.



With our new insight in Natueco Culture, it is possible to establish all these polyforests in any close vicinity without any external inputs. In cities and urban localities, where water is an assured resource, every house and every roadside can become a human rainforest by recycling the waste water. In nature, convectional rains build-up equatorial forests. Whereas in the cities and villages, small mist jets with little electrical energy will create equatorial micro-climate at regular intervals, adding a variety of bio-mass in every nook and corner of the city. The energy balance recovered will be 100 times the energy invested in running the mist jets.

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Chapter 7 :

***Market Gardening :
Plantations for market sales***

- 7.1 S - Agriculture
- 7.2 Prosumer society
- 7.3 Rurbanisation
- 7.4 Eco-Economics
- 7.5 Beguiling nature of present economics
- 7.6 Market Gardening

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Plantations for market sales

7.1 S - Agriculture

With assured record production comes sharing between producer and other consumers; and with sharing comes marketing. In an ideal free-market the consumers' sovereignty alone should reign. Unless this is so, it is not an ideal free market. The present market system is committed neither to the producer nor to the consumer. Markets are now controlled and manipulated by the "bulls" in share markets and by the monopolists in the community, who really are traders and money managers, but neither the producers nor consumers.

In the present market system, the commodities are polarised and monopolised. So the consumer is at the mercy of the market mechanism manipulated to create highest price hike and black-marketing of essential commodities. The consumers are made to feel helpless and the culture of waiting for hours in queues after queues, even for ordinary goods and for passenger tickets is deeply rooted in our present mode of living. The markets are not meant for the consumers but are meant only for the money makers & the profiteers. So the system is now oddly but aptly named as "money market" where money is the only goal and where money is invested to create more money and not for real wealth generation or for welfare.

We have seen, in the previous chapter, how Natueco Culture helps one to evolve and evaluate, various new agro ecological principles in the entire farming system,

Readers comments on 7.1 and 7.2 are eagerly awaited.

This is your personal space to make more observations.

The word agriculture is also to be understood in a new context. To P. P. the term agriculture truly emphasises agreement of different resources in all instantaneous events going on in the neighbourhood domain. Different resources include not only neighbourhood material and energy resources but also individual, family, social, cultural, educational and other institutional resources through networking the sun with major emphasis on demystified latest knowledge resource.

Thus Agriculture is Agree-culture or agreement of all the neighbourhood cultures existing and evolving.

through judicious combinations of new principles of harvesting the sun, through well planned crop diversity and recycling of nutrients and management of scientifically planned and executed other factors of production. With high level of science and knowledge investment, each one of us can be made capable of achieving assured high standard of success in whatever agricultural product one intends to take. With this success of Home Farming at the doorstep of every rural household, 10,000 sq. ft. land is tantamount to one's own market place for fulfilling one's daily requirements in food, fodder, fuel, fiber, fertiliser, fruits, flesh, fish, egg, milk, spices, etc. alongwith farmhouse fish ponds, farm shade, free time and real freedom of living, as only then one is freed once and for all from the vagaries and clutches of the present market system. The real achievement of Nature home farming system is that it re-establishes the consumers' sovereignty on a very stable footing.

A new term Sagriculture has been framed to emphasize all these new aspects of Natueco Culture. Natueco Culture has four key features :

1. Sun,
2. Science,
3. Sharing,
4. Sovereignty.

These four S's are prefixed to "agriculture", and then we get S⁴ agriculture or S-agriculture or Sagriculture.

With this new term of Sagriculture, it will become easy to grasp the new connotation of Sharing and Sovereignty in the scheme of Market-Gardening. According to Prayog Pariwar, the markets are not only meant for distribution. They are instruments for sharing as also for fostering and preserving sovereignty of the consumer and the community. Alongwith these parameters of Market-Gardening, an additional parameter also needs to be emphasized and is discussed below.

7.2 Prosumer Society :

The term prosumer is a combination of the words “producer” and “consumer”. Only when producers will also be consumers, then a close link between wealth generation, distribution and consumption of wealth will emerge. In Nature’s ecological framework three biotic components, 1. producer, 2. consumer, 3. decomposer emerge. The autotrophs (who make their own food) produce and share their food chain with heterotrophs and with the decomposers (the micro-organisms). There is a macro-micro link in all Nature’s working and the sharing is totally done through nutrient elements and through energy exchange carried through various organic and other compounds (carbohydrates, proteins, oils, minerals, organic acids, hormones and so forth). In prosumer society we will be bringing in these new processes in our present exchange systems.

In nature when a hen consumes grains, the flesh of the hen, the feather, the eggs, come through the networking of energy in grains (through genetic codes). Thus while consuming, the hen produces many many new useful things for its survival & propagation. Thus nature is both a consumer & producer, in short a prosumer system on which this complex ecosystem rests.

In ancient Indian scriptures there is an apt allusion to this new concept of prosumer society. We find that the scriptures mention four clear categories needed to support a flourishing society :

1. Vibhu 2. Prabhu 3. Paribhu 4. Swayambhu

The word Vibhu can be taken as one who possesses knowledge through SCIENCE, through intuition and through the insight of the genius. Prabhu signifies sovereignty in toto. The word Paribhu denotes SHARING with the neighborhood and the word Swayambhu suggests living within the neighborhood resources such as Sun, land, rain. Thus the term prosumer is in a sense a broader concept than Agriculture as it includes Sun (Swayambhu), Science (Vibhu), Sharing (Paribhu) and Sovereignty (Prabhu) and many more attributes beyond that.

A prosumer society will thus be not only of consumers or producers of one thing or another but will be basically a society in which each individual will be both a producer,

and a consumer of 1. New knowledge 2. New wealth as also 3. Harvester and utiliser of energy which, in another sense, means a Producer of energy (in one form to another) and a Consumer of energy (to pump out and reduce entropy from the system).

The Prayog Pariwar concept of market gardening includes these added attributes of Prosumer society.

7.3 Rurbanisation :

Eco-Economics & Agriculture -
Paper available.

To help understand Market Gardening, let us scan the new term that is now in vogue viz. Rurbanisation. It is mooted as a complex of Rural and Urban systems of living, keeping the best qualities from each. At present the rural people are devoid of amenities, variety of choices and luxuries available to the urban people in the city. At the same time the city people are nothing but prisoners in concrete jungles and victims of the pollutions created by the surrounding factories and by the transport system. They have lost their due real quota of leisure and natural pleasure which most of the rural people enjoy even in abject poverty conditions. So a good mix of leisure, pleasure, with high standard of living in the close vicinity of nature is promised by Rurbanisation.

The present commercial, scientific, technological, industrial society has emerged after the Second World War. Before the Second World War the access to energy resources and other mineral and agricultural resources was through colonial expansion. But after the Second World War the access to energy resources has been secured through money market mechanisms and expansions instead of colonial expansions. The countries like U.S.A. that have till date externalised these costs have survived but countries like U.S.S.R. that failed to externalise these costs have collapsed. Now the whole world is afraid of possible instability in the money market systems, various nationwide international mafias, military coups and currency instability and black money frauds.

City life has become successively insecure and unstable. Unemployment of the educated masses is at its zenith, faith in the government and judiciary has reached its nadir. People await a new breakthrough for better and greater production in every sphere of development as also for equitable distribution and sharing of the enormous wealth that latest advanced science promises to the human race as a whole.

The success of Natueco Home Farming is sure to create this new shift and push for Rurbanisation of the present society. As the last man in the field, "the small farmer", will become the prosumer, the present tactics of keeping rural people illiterate and ignorant and making them victims of monocropping agriculture based on chemicals, will get exposed and abandoned. In every village, as each household will be a unit in Home-Farming, there will be no free labour available at the bottom rung of the society. Markets will not be able to push them towards "distress sale". The rural people, equipped with demystified science and with de-professionalised education, will have, their own technological literacy, to be called techniracy, to resolve their local resource problems on their own strength. They will learn on their own, how to mobilise their internal and neighborhood resources and will build up their own energy resources through harvesting the sun, winds, tidal waves, waterfalls, etc., as well as through the effective use of animal - energy and also mechanical, electrical and other forms of energy. Their dependence on city market will be only for high energy industrial products. Their other needs would be mostly met through the development of a new type of Market Gardening complex.

When the community is sure of producing record yields in any agricultural crop, the community learns the art of marketing as well as the science of processing.

Thus this prosumer society is bound to become a commercial and industrial community. The grape revolution in Maharashtra has proved it. Thus a new space for all-around, all-level development is created under Home-Farming. We will pursue this discussion elsewhere, later, but it should be reiterated at this stage that the concept of Home-Farming internalises the best aspects of Rurbanisation and leads to the establishment and propagation of the concept of Market Gardening developed by Prayog Pariwar.

7.4 Eco-Economics :

Many other illustrations from the readers are pouring in.

My travel in the foreign countries and especially my interactions and involvements with many restless innovative thinkers, intellectuals and activists made me realise that the urge for Home-Farming, City-Farming has now become universal. The energy conscious economy in U.S.A. has made many of them realise more intensely that the present economic system is so maneuvered as to make the consumer the first and the last victim of all economic production goals. By alienating knowledge from real life situations of the individuals, through the prevalent school systems, the economic system has created assets for monopoly and polarization in the distribution network, annihilating the consumer sovereignty in this weird game.

To relieve our society of this situation, as a corollary to Nature-Farming, we must accept Nature's 'Energy Currency Unit Exchange System (ECUES) in place of the present paper currency in our money market. The entire exchange in any nature system is through energy units. This value system has its transactions in terms of quantas & photons, at atomic and molecular levels; as A.T.P., A.D.P., A.M.P. in bio-chemical and biogenic levels, as electro-volts & microvolts in sub atomic and other levels and as calories & kilo calories and watts and kilo watts in our food and fossil fuel systems and also in horse power hour or man (power) day units.

The atomic, chemical, biochemical, the heat, the electrical and the mechanical energy units are related with each other in terms of energy equivalence. Thus one-man-day table work is about 860 kilo calories. It is equivalent to one kilowatt hour (kwh) of electrical energy or to the energy expended by a draught bullock in 45 minutes of its normal work. Nature's food or fuel chains or thunder storm lightening or the potential energy of any mass or kinetic energy of water-fall, all are transacted in energy equivalence units.

If mankind is to survive and is to make real cumulative progress through enrichment and enhancement of Nature's system, then the sooner we realise and adopt Nature's currency system the sooner there will be more and more added enrichment and enhancement of wealth generation, creating an ever growing sense of prosperity and abundance for all. Only the adoption of energy currency system will bring real wealth generation and abundance. The paper currency notes can bring richness that is in no way comparable to real prosperity or abundance. It is not the note but the effective green leaf that develops and determines nature's economy or its entire household maintenance activities. We term this new system as Eco-Economic system.

Let us take a couple of illustrations to understand how and why the present money market system has created various dilemmas in development, where riches can be achieved, if at all, by only a few and the majority will be only poor or paupers. Where riches cannot create prosperity and abundance for fuller and better consumption by each one among the masses, where increasing pollution and degradation of nature's resources is the only outcome of any agenda of development -(construction of dams, atomic reactors, fertiliser factories and so forth), and in spite of which the most highly organised polity in U.S.S.R. failed to usher an era of welfare, where the difference between the rich and the poor was sought to be minimised.

The first answer to these dilemmas dawned on me while answering a genuine query by my foreigner friends when I was invited by them to give expositions on the Prayog Pariwar approach of total development. The query was straight and simple.

How is it that the grassroot man in India is able to survive even within the abject poverty ? I explained that in foreign countries, agriculture was a highly subsidised industry with high external energy inputs such as fertilisers, drip-irrigation systems, super-energy intensive green house technologies, use of power tillers, tractors, and instant telephonic contacts with the experts in the extension agricultural sections. It is in a sense an example of highly sophisticated wasteful economy where to raise a crop of one kg. of wheat, (which contains 3000 k cal energy), an energy equivalent ten times of what is earned (3000 k cal) is expended. Naturally unless they are highly subsidised by the government for these external energy inputs, no one will remain in agricultural profession.

In India on the other hand, we blame our farmers that they are not putting full efforts in their farms. But the energy they expend to produce one kg. of wheat or grain, is only 800 k calories, which is less than one fourth than what they earn through the crop. The Nature's food chain economics has thus extended this survival potential to the grassroots man in our country.

These results were the outcome of farming done by Natural farming, that is, trusting nature's methods. With our new insight in Natueco-Farming, where farming is done by knowing nature more and deeper through scientific and experimental enquiry, much much more can be produced, at least four times more than we were getting now through present natural farming or commercial farming. So our farmers will be more prosperous than what they were in the past.

Critical comparison between the present & future industrial life and living.**Present Industrial society**

It is multinational in nature.

It is management driven.

It runs on cut throat competitions and gimmicks in the share market.

Profit motivated & exchanges in money terms not in energy equivalent terms.

Maliciously & malignantly energy eroding and energy exhausting from our ecosystem with no commitment to replenish the energy used.

Heading to create an affluent society with wasteful consumerism and polarization of society in rich & poor.

Thrives on hidden subsidies given in energy exchanges in money terms & not on energy equivalent terms

Highly dependent on money market interventions.

Future Industrial society

It will be decentralized in nature.

It will be education driven.

Will grow through cumulative enrichment and enhancement of neighbourhood resources

Will grow through cumulative enrichment and enhancement of neighbourhood resources.

Energy harvesting, conserving, upgrading, investing, using to build higher order of enrichment & from within resources.

Heading to create prosperous society where each one will be both a consumer and producer of goods, energy & knowledge at every stage of living. It will be prosumer society, promising equity liberty & prosperity to all.

Cash inputs will be needed at the most in the early phases of growth in poverty stricken groups only.

Totally free of dangers of any organised market interventions.

Thus in Eco-economics system, the price should depend on the inherent natural equation of the optimum calorie units expended and regained in the process of production and distribution. This new concept emphasises that each individual must receive a price not in terms of money units but must have the right to claim and earn equal units & calories of energy in one form or other. Let us further try to elucidate, explain, exemplify and amplify this concept to understand the implications of this fresh insight in the process of energy exchange.

7.5 Beguiling Nature of Present Economics

1. Paper Money

Nature's whole bewitching, complex ecosystem has emerged without any cash inputs or subsidies from human monetary systems.

The present day economics is called political economics in which the price line is determined by the demand and supply mechanism. The exchange unit in this system is mostly paper money and all types of credit extended and honoured. The whole system is run by a highly organised sovereign polity. No price is assigned to the natural resources and they are called free goods. Instead of adequate use and enjoyment of these resources, we are allowing their exploitation in such ways that entropy is pumped in and permitted to increase rather than it (the entropy) being pumped out and reduced as in the nature's scheme. This is bound to accelerate us towards our doom and annihilation. The following examples clarify how and why this is happening.

2. High Energy Waste :

P.P. believes in using Nature's process for our economic growth too.

The best illustration for highlighting this parody is the heating system in our cities. We have electrical geyser for heating water in cities. The required electricity is generated at thermal power stations by burning high quality coal. Then this energy is transmitted to our house through networking of grid system.

We transform this electrical energy back into heat energy for the water-heating purpose. The net loss of energy in this whole process of conversion and transmission is immense. Moreover the price of a unit of this electrical energy is artificially kept ridiculously low for political reasons. What is worse, this is not taken as a fraud but is viewed as a decent energy bill transaction.

3. Parity of Pricing :

If we consider one man-day work in energy units, it is equivalent to 860 kilo calories for ordinary labour and about 1200 kg. calories for heavy labour. The minimum wages as fixed in India for one man-day work at present are about Rs. twenty. One unit of electrical energy in kilowatt hour is equivalent to 860 kilo calories of heat energy. But the price for one unit of electrical energy is hardly more than a rupee or two. How are we to account for this disparity in energy equivalence ?

We pay no heed to nature's parity of equivalence in energy while deciding our pricing. Bluntly speaking, this is nothing but swindling of nature's commodities, as lavishly and wastefully as to beat any stretch of imagination.

The dire consequences of such pricing system have polarised all economic activities. Had the pricing of electrical energy been on par of 860 calories, worth one man-day work which is fixed at twenty rupees, various glaring disparities in economic transactions would get exposed. For instance, in Natueco Culture one sq. foot of sun harvested over hundred days, yields about two hundred grams of dry biomass worth energy of 860 kg calories. If we use such biomass as fodder for our draught animals then using their bio-chemical muscle power we can run generators for the local electrical supply.

Nature's networking of pyramid of life is through exchange of energy in energy equivalent terms.

Prayog Pariwar is now trying to establish these new energy (electricity) generation units.

- Bagasse use
- Bullock power use.

Thus we can link harvested sun energy in the fodder to the muscle power of the draught animals and then in turn to the running of the generators to produce electricity. The price of 200 gms of dry matter must, therefore, be equivalent to 1 man-day earnings. Only then will the conversion of fodder to electricity through the use of the animal muscle power will be economically feasible. At present, in fact, this dry mass (fodder) is viewed merely as trash, and costs hardly a rupee.

Thus the evils of today's economy are mostly due to manipulated low prices of electricity and diesel through hidden subsidies. If these subsidies were removed and the parity of equivalence of energy units were re-established, human labour every where in the world would be restored to its dignity and its true economic and social value. Then alone human labour would be preferred as more economical and sophisticated over electricity in many applications. Then alone the importance of dexterity and originality of handloom operations would be restored vis-a-vis the powerloom operations. Such a revised pricing system will also make it viable to use farm animals such as oxen for decentralised generation of electricity in villages, for which an institution such as NITIE in India has developed excellent mechanisms which will then be picked by the industry if the principles of eco-economics will have the first and final say in deciding the pricing of all types of commodities.

4. Un-accounted Energy Costs :

To pursue this discussion let us take the bitter story of the sweet sugar we consume. A spoonful of sugar of about five grams is worth about twenty kilo calories of energy. But to produce this sugar we have to evaporate and process sugarcane juice.

The sugar percentage in raw juice is about ten to twelve percent. To evaporate the water in the juice to extract sugar, more than half kilo calories energy is needed per milliliter of water to be evaporated. So the energy needed for evaporation turns out to about twenty five kilo calories of energy. So the spoonful of sugar, because of this value adding process, is worth $20 + 25 = 45$ kilo calories of energy expenditure. If we add to this the transport energy for carrying sugarcane to the factory and sugar to the consumers we will be shocked to learn that 5 gms of sugar at our table implies equivalent energy expenditure of not only twenty kilo calories but about fifty kilo calories. This inflation of energy in our commodities is never dreamt of even by the experts in the pricing system. Our beguiling economic system has created this sorry plight, as no environmental debits are accrued or assets generated are taken into account in the pricing of a commodity.

5. No Commitment :

We see how the present money market system has been based on cultural arrogance and material opportunism in the current economic system. It strives for putting profit before every thing else, before ecology, before Nature and before people too. It is callous of everything except profit. The sovereignty of States has now become a myth in the hands of multinationals and money marketers. The present agricultural, transport and industrial systems are great consumers of energy, contributing to entropy rise in the eco-system. As per the first law of thermodynamics, matter & energy cannot be destroyed but as per the second law, it can be degraded. The present economic system makes no commitment to halt this process of degradation.

Let us ponder the case of supply of fossil fuel gas for (LPG) cooking purposes in our cities.

The fuel gas cylinders contain about fifteen kg. of petroleum gas. The calorific value of one kg. of this gas is about twelve thousand kilo calories. In coal units it will be about ten ordinary fuel coal units as the calorific value of one kg of ordinary coal is about one thousand and two hundred kg calories. Now under the Eco-economics there will be a commitment that each consumer of one cylinder of fossil fuel gas will have to account for one hundred fifty kg. of coal or wood flints or wood dust. For only through this exchange system he will be recycling the carbon dioxide released in the air in the process of combustion and again harvesting the sun through the biota in the neighborhood ecological system. Thus the rural people will make this supply of wood or coal to the city people and they will be given fossil fuel gas cylinders in exchange, for their participation in harvesting the sun and thus reducing pollution and entropy of the habitat. This just adjustment of balanced energy and commodity exchange can never be thought of in the present economic system as it makes no further commitment to avoiding increase in ecological degradation caused by burning of various types of fossil fuels.

6. Cold-storage dilemma:

At a university seminar on experiences in rural development, the chief guest tried to emphasise that cold storage facilities be made available to the farmers to help them preserve their fruits and send them to the foreign market. When I discussed the problem from the point of view of Eco-economics the whole audience got restless on learning that what we call development is nothing but depletion of our rare energy resources.

"Do Farmers in the third world face extinction?" when polyhouse technologies will supersede cold storage markets - a News feature, available.

I argued that to keep one mango fruit of four hundred gms (about two hundred calories worth) fresh, we will be expending energy more than a hundred times on it, that is, about twenty thousand calorie units.

We also have to consider other energy units lost in cold storage transport. So in short we expend a lot of energy for making our fruit available to the foreigners and bring in return some foreign currency that may not be even worthy of purchasing the energy we have squandered for those countries. If on the other hand the exchange had been, firstly, on energy terms, secondly, on recouping the depleted energy from our entire eco-system and lastly on the other use value of the commodity, then alone the rural people who sold their fruits to the foreign market would have been really enriched. Making people rich by giving high prices does not guarantee the real repayments of the bargain and the enrichment of the producer. The present economic system is blind to any such enlightenment.

With this new vision in marketing, let us now study the second aspect, gardening, in our scheme of Nature-Farming based Market Gardening.

7.6 MARKET GARDENING

1. The New Horizons

With the above analysis of economic energy market system one can now evaluate how the present style of living in all the so called advanced countries and affluent societies is but energy-wasting living. In our new approach of home farming, a new human resource base is created through investment of the latest of science and knowledge amongst the masses unto the last man, through the strategy of dispersed optimised multi-tier canopy management.

Affluent societies create one sided consumerism while prosperous societies create prosumerism.

The only marketable goods in the near future will be energy marketing of electricity through local, regional & national grids.

These grids will be of entirely different nature than present ones. (A combination of photovoltaics, laser beams, trajectories, etc.)

With the minimum of water and biomass infrastructure as defined in our discussion we will be reaping a high middle class standard of living by harvesting the sun over ten thousand sq.ft. We have termed this phase Home Farming which can be done in villages or cities.

Farming signifies production primarily for self-consumption and also for sale in the market. But with man's new dialogue with nature in Natueco Culture, the small habitat and rural economy will flourish to such an extent that a new healthy shift in marketing operations will take place. The money market model will gradually dwindle and the new Eco-economic energy model of market will evolve.

These new horizons in the marketing mechanisms can change the entire pattern of production in the rural agricultural system. Agriculture will gradually become more of Sagriculture and the society will become more of a prosumer society. So no farming will be done, as it is done today, of cash crops and monocrops. To-day the farmers are forced to sell their primary or raw commodities to the market or to the large scale co-operative processing industries (sugar, milk product, oil extraction, spinning, ginning, textile etc.) By keeping the producers completely ignorant of the ways of processing and preserving of their produce, the producers are made victims of the game of trading and marketing and are often forced to make distress sales. The Home-Farming system is going to re-establish the lost sovereignty of the producer along with the consumer.

Alongwith the establishment of the Home Farming, a next phase of technological transformation that will enhance the carrying capacity of the neighborhood ecosystem is foreseen.

The new concept of Market Gardening is fostered to derive maximum Eco-economic benefits from increased photosynthesised and vegetative production of the species that are chosen to obtain a product mix that will help to meet permanently, or at least for a period of one or two generations, a variety of needs of the rural producer. So in this phase there will be some permanent planting of plantation.

It will be therefore more in the nature of gardening, and not of farming, that will evolve a new system of “Eco-economics Marketing” in place of the present market system.

This entire approach is of a non-structured nature in which the traditional institutional set up is kept undisturbed. We all have so far believed that the progress in the “**System**” can be made only through one or more of the following alternatives:-

The use of the word system implies man-made establishments which have become unresponsive & rigid.

1. The first alternative is “to use the system”, that is, make maximum use of the laws, the rules and provisions and potentials existing in the system.
2. The second alternative is to “improve the system”, that is, to strive to recognise that the present laws and provisions and vested rights and customs etc. which are beneficial only to a privileged few in the community and to get these reformed changed and improved, through patience, perseverance and democratic procedures or through educational and training inputs.
3. The third alternative is to “change the system first, that is, to follow the path of revolution than put faith in the process of evolution and try to change completely or, in part, the structure of the society.

4. But the best approach that Prayog Pariwar has evolved and now well established is to “withdraw from the system”. This approach allows the present system to run its own course, but creates new promises and possibilities for anyone, unto the last, through de-professionalisation of education, and demystification of latest of the present day science, to help each member of the society to venture in real life situations of his own, within the neighborhood ecological assets.

The concept of Market Gardening is therefore in no way asking to shift to this or that production for achieving the best present day market gains or profits. By creating new avenues and promises for the masses or for the have-nots (through science and knowledge investment) the prospects of the haves may change somewhat, but even for them too, these prospects may then further increase and not diminish.

2. A New Vision for Gardening for Market :

The crux of our new argument is that the whole web of ecology is through pumping out entropy through harvesting the sun and through its food chain. Unless our habitats succeed in doing the same job of pumping out entropy from their immediate and nearby neighbourhood, there is very little scope for better life and living. The new paradigm says that the neighbourhood ecosystem is capable of generating the biomass surplus along with the concurrent energy surplus needed to provide the input for infrastructure development. Then our techniques of extending all necessary demystified knowledge inputs for infrastructure development, will create new avenues for creative skill developments and for better adaptive expressions.

All fauna and flora of nature have flourished on their own through the evolution of such adaptive mechanisms. The human race can now evolve such adaptive mechanisms on larger scale by knowledge communication and dissemination through recently developed networks of computers and telecommunications. So we find that, as biodiversity in nature's ecosystem is an expression of better symbiotic living and better support value to one another, similarly the socio-cultural diversity among human beings too fuller expression of better quality of life and economic growth, in consonance with the new Eco-economics.

With this approach the human race will gain a fuller and richer vision into the present life process through various new cultural developments and interactions. The resulting society will not be dominantly monoculture. It will be truly a multicultural society run on the tenets of creating, harvesting, conserving, saving and investing surplus energies of various kinds in the immediate neighbourhoods of every habitat, home and locale, as per its needs and requirements. It may be of interest to note here that the desert people evolved their culture entirely differently from those living on the fertile plains. The same process of throwing up multifarious cultural identities may be expected under our non-structured approach of Market Gardening.

Let us now study more critically the energy aspect to get a deeper insight in our concept of Market Gardening or, in a sense, Eco-Gardening.

Optimization of energy is possible through hybridization of energy as per the local conditions.

Detailed report available :

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One of my friends, Dr. K.R.Datye, has prepared a very clear and pointed note on this energy aspect of neighbourhood eco-economic development. Let us state the salient points of this note, briefly, as follows:-

(From unpublished data by Dr.K.R.Datye)

1. In traditional societies before the Industrial Revolution, bio-energy in the form of wood as fuel, feed for animals and food for humans was the main provider of needs.
2. Industrialisation started with greatly increased availability of fossil energy-mainly coal. Much later, it was further accelerated by availability of petroleum (liquid or gaseous) fuel.
3. Using the coal equivalent units of energy as a norm, towards the end of 19th century, most of the industrialised countries had per capital energy availability of 5000 kg. coal equivalent, annually.
4. This was mainly used for transportation or to produce armaments.
5. Through a monopoly of trade control over colonies, bio-resources were available in the form of wood, cotton, wool, hides tea, coffee, rubber etc. on extremely favorable terms of trade or by direct acquisition or rent extraction to colonial powers.
6. Today the developed countries command per capita, 6,000 to 10,000 coal units equivalent, annually.
7. In the developing countries like India and major parts of Africa the availability of commercial energy per capita is only five hundred kg coal equivalent per capita per year.

8. USA has the largest available energy resources but uses it in the most inefficient manner. Till now this wasteful economy could survive as it externalised this cost. For producing the same GNP Japan and some of the European countries use only about 50% of energy consumed by USA.

Personal space to make observations.
Comments, observations, suggestions, contributions expected from innovative experimenters.
9. **Bio-energy has never been considered in the estimation of resources. Growth Scenario for the alternative paradigm indicates that bioenergy and renewable energy can create a surplus of about 2000 Kg wood equivalent per capita, after meeting all the food, fuel, fodder and subsistence needs of wood.**
10. **It can be demonstrated that with appropriate technology the use of 1 Kg of bio-energy of wood can easily exceed two or three Kg. of fossil energy coal equivalent.**

This will only require the development of process technology and better utilisation through user awareness.
11. Higher energy efficiency will be achieved and a lot of energy will be saved by :-
 1. Modern techniques of information communication.
 2. Taking the work place closer to home and thus helping dispersal of industry.
 3. Using efficient public transportation systems to replace personal transportation.
 4. Using lightweight high value material in lieu of metals (glass fibers instead of copper wires), the energy availability of 2 to 3 tons per capita per year wood energy equivalent will match the energy utilisation of 5 to 6 tons coal equivalent per capita at present. Thus the saving of this much energy will be equivalent to provision for pumping out of entropy from the neighborhood.

12. Solar heat can be used for processing. Research in Arizona & Israel has already shown that semi arid region can produce 1 to 2 tons of petrochemical intermediates and 4 to 6 tons of fibres and fuel per hectare per year. In 1973 when Arab Oil Embargo was imposed, Nobel Laureate Dr. Nelvin Calvin coined the terms Green Industry and Petroleum Plantation. He studied the conversion of latex from the plants belonging to Euphorbiaceas family producing lower hydrocarbons.

Instead of converting latex from these plants by degradation into petroleum like products the scientists from Sriram Industrial Research Institute, New Delhi use these latexes as building blocks to produce commercially useful polymeric materials and formulations.

Products prepared from this are polymeric formulations, mainly varnishes and paints useful as protective coating for making moisture and water resistant wood, corrosion resistant metal sheets, electrically insulated paper adhesives based on resinous matter for metal-to-metal joints and for transparent glass-to-glass adhesion. Out of the various products produced, water thinable emulsion paint based on latex has a tremendous water saving potential. Two litres of latex of euphorbia royaleana and various additives costing about Rs.50/- gives six litres of water thinable emulsion, equivalent to acrylic emulsion paint which is four time costlier in the market.

Moreover in the development of high impact material 10% of rubber has been successfully replaced by the latex from the euphorbia royaleana growing in the tropical deserts.

These and other similar references will highlight various new possibilities of energy plantation in the neighbourhood of rural ecosystems.

Market Gardening is nothing but
Energy Plantation.

The traditional bamboo, sugarcane, maize, coconut tree plantation and other fuel wood plantations along with euphorbia plantations etc., will make net additions to the energy availability through Market Gardening of such plants and trees.

The hold of market mechanism dominated by large industries and the development bureaucracy and the financial institutions, like the World Bank, will progressively diminish as surplus from bio-energy and renewable energy will get established in the rural neighborhood by chain plantation and extraction.

The transition from the present age of hydrocarbons- petrol, diesel, fuel gases; to the age of carbohydrates - alcohols through cracking of oils and latex - is now in the offing.

Market Gardening for energy plantation will be the starting point for this new revolution. The present unfair terms of trade and low value of primary products will then cease to exist. To quote an example, Sorghum (Jowar) millet is a food of the masses but there are varieties of millets that can yield good quantity of alcohol and alcohol is nothing but a high value energy resource.

So is the case with sugarcane crop that can yield good biogas per kg of its weight equivalent to ten kg of cowdung.

3. The Value of Energy System :

1. The value of energy is dependent on the use it is put to and the nature of its handling. Thus liquid fuels are preferred to solid fuels and to gas fuel, unless gas is delivered through pipes or through containers and cylinders. Consumers always prefer a captive and highly adaptable and handy-at-source energy.
2. The first high-value level of energy is mechanical energy. Here biofuel energy can very well match fossil fuel.

Communication of results
from such experiments to
P.P. is welcome.

In fact fossil fuels have been even replaced in gasifier driven IC engines; and liquid biofuels have been produced in large quantities in Brazil from starch and sugary juice.

Literature on Permaculture notes that, Low or no tillage grain and starch root crops, or sugar rich carob beans, plums, or sugarcane and beets (and we may add starchy crops like sweet potato, elephant foot, cassava, yams etc.) can be fermented to alcohol to supply fuel in every household and farmers can thus produce a clean-burning fuel for cooking, lighting and essential transport. Most communities have (legally or illegally) a gifted distillation expert. Moreover the pay off of the remaining residue is that the protein value of fermented product is not reduced but enhanced (dried waste grains yield 20-25% protein). Thus the use value of the alcohol waste as poultry and animal food is also enhanced. (In nature the bacteria-flora in the rumen of the animal makes this addition of proteins & vitamins and the bacteria in the large intestine of man also make substantial contribution to B group vitamins from the rejected waste products in the intestines).

There is another report quoted in Permaculture literature for fuels from Crop. It is estimated that 5000 - 8000 litres of fuel alcohol can be had per hectare per annum from sugar beet. Same is the case with sugarcane. We can have the advantage of direct fermentation to alcohol. While in grain & starches sprouting, boiling, grinding & enzymes activities are to be first carried out to produce glucose or sucrose before fermenting to alcohol.

3. The second high-value level of energy is in materials like timber and fibre. Modern processing technologies, as mentioned in euphorbia latex use, open up the avenues of changing the value of natural fibres and wood through local small scale industries.

Lignin, cellulose, the main constituents of wood are amongst the strongest materials (even elephants can be tied with ropes made of these materials) in terms of strength properties. In relation to weight, these compare very well with high technology products such as carbon-fibre-composite and metals such as aluminum or steel. After processing, the value of such wood would exceed three times that of steel.

4. The neglect of this value addition potential is a major flaw in the current energy conservation strategy. Process industry will afford opportunities for utilisation of solar heat energy in a cost effective way. Thus the new concept of Energy Plantation, opens a new vista in our new concept of marketing and Market Gardening. "Gardening" as distinct from "farming" is a regular permanent plantation, more for creating energy surplus or for creating raw materials used for processing and preservation, rather than for consumption at the primary level.

Capabilities of processing natural fibres has been the hallmark of civilisation. Recently, consumers' preference is more for natural fibres - cotton, silk, wool, leather, etc. than for synthetic goods. The strength characteristic of natural fibre such as jute, sisal, coir, mesta and remmi, is superior to HDP and polypropylene. Durability and quality of natural fibre can be increased through blend-techniques, preserve-techniques and through techniques of encapsulation.

These and similar quantifications and measurements of value additions in terms of energy and not in terms of money, will change the entire spectrum of exchange and distribution of goods and commodities in the near future.

P.P. network is now experimenting in these various areas of neighbourhood industry.

We can fix equivalent energy measures.

If by consuming 4 kg of coal energy we get 1 Kg. of quality steel.

We can fix the measure as

1kg steel=4kg coal = as fuel.

But if this biomass is 4 Kg. timber which has the structural property of steel, then 1kg of steel can be equated to 1kg of wood, which is the real energy gain in our industrial system, but in money terms, this is never so (strengthening wood through new material techniques to carry on the functions of steel is an established fact in modern technology). But vested groups have not made this popular.

Enrichment is qualitative improvement, while Enhancement is increasing the support value of the system.

4. Internalisation of Input Costs :

In the new horizons of Eco-economics Market Gardening, the basic strategy is to work in a non-systems way, to establish rich provision of surplus energy resources. It is not only through enrichment but also through enhancement of energy that this has to be achieved. The enhancement of energy comes

1. through efficiency of its use as in integrated electronic circuit systems
2. through value increase of a product or a commodity (heart pulsars etc.) or
3. through its capture at source availability.

The other strategy of Market Gardening is to reduce the external inputs to a minimum and to build up a close internal network of mutual exchanges. Let us take one illustration from our recent experiments in dairy development amongst resource poor people in drought prone areas of Maharashtra.

This PP group is rearing good breeds of milk cows and buffaloes. The knowledge input for getting record yield of milk was imparted to them first. With this new insight it became very clear to them that for each litre of milk produced the milch animals have to make provision of four percent special sugars, four percent special proteins and four percent special type of fats. That is, to get record yield of say ten litres of milk from a cow, the cow must produce daily 400 gms of special sugars, 400 gms of proteins and 400 gms of fats. In addition to this, the cow will need some food for its maintenance and some minerals and vitamins. After daily consumption of food the undigested part of the food as also the break down elements of the body and intestine system of the cow are given back to the nature through dung and urine.

The further bio-degradation of these waste products will mostly return back the nutrient elements of the soil as well and will add to the humus and lignoprotein content of it.

With this information it was very easy for them to grasp that they can locally supplement the fat content of the milk through the oil content of the groundnut, cottonseed, sunflower seeds or from the oils in skins of red pumpkins, bottle gourd or ash gourd crops as also from cotton balls.

The skin of red pumpkins have oils similar in smell to butter; and these are accepted straight by the animal's digestive system.

Similarly for special sugar provision in the milk a corresponding amount of fresh maize fodder which is just flowering will be a sure substitute. Also, sugars from fruits like pumpkins can make a good supplement. It has been confirmed that one kg of pumpkin with its skin and seeds mixed with little quantity of raw sugar can produce an increase of one litre of milk in milch animals. Similar are the results with one kg of sugarcane that can be used for sure increase of one half litre of milk, as it contains 100 gms good sugar as well with some fatty compounds in the waxy cover on the bark of the canes.

These are the immediate neighbourhood substitutes that one can intelligently plan to grow through properly harvesting the sun. Then these activities will become a way of making special provisions for milch animals and of procuring the best inputs in the scheme of Market-Gardening as all the necessary inputs are raised and used locally.

As for proteins, the soyabeans, pigeon peas, cow peas as well as different oil cakes can make good provisions. Moreover tender branches of wild fig trees will provide various milk raising ingredients through its latex.

Trial experiments in rearing goats & cows along these lines are already conducted. Case studies available.

By considering the consumption of various vegetative organs such as leaves, stems, branches, roots, pods, grain tubers and fruit and their relative proportion for the principal plant species the total glucose requirement and so the total harvesting of the sun to have these produce can be summarised as follows :

The most important relationships

Plant species	Glucose requirement in gms. per gm. of total biomass
Arable Crops (Non legumes).	1.45 - 1.50
Legumes	1.65 - 1.70
Sugarcane	1.50
Tomatoes	1.40
Various grasses and fodder	1.45 - 1.50
Tubers (Cassava, sweet Potato)	1.3 - 1.35
Maize rice Sorghum grain	1.45 - 1.55
Cow - Pea	1.65
Pigeon pea and other beans.	
Groundnut & Soyabean	2.2 - 2.5
Trees (mainly cellulose and lignin)	1.4 - 1.5

All eco-system lovers should internalise this table to experiment and establish their relationships.

Doing it & testing it yourself, is the best way to learn.

Source: Simulation of Eco-Physiological processes and growth in several annual crops—F.W.T. Penning de Varies et al (Pudoc, Wageningen 1989), extracted from unpublished data of K.R. Datye.

The tabulated glucose requirement includes requirement of biosynthesis in transport and reduction in the plant.

Thus all the assimilation and dissimilation processes are considered.

The following table is also of importance while considering various provisions of the food chain. (Source as above).

Plant Component	Heat of Combustion Kjoule per gram.	Glucose requirement grass per gram
Carbohydrates	17.3	1.3
Proteins	22.7	2.7
Fats	37.7	3.2
Lignin	29.9	2.3
Organic acids	13.9	1.0
Minerals (K Caps)	not mentioned	

Internalise this table too.

1 Kilo calorie = 4.16 Kilo joule.

With such studies and with proper recycling of animal waste to produce all these crops at optimum level, we may now try to establish that for a good milch animal (yielding 3000 liters of milk per year), an area of about 5000 sq. ft. will be more than enough to raise all the above mentioned mix crops.

Thus by internally producing all inputs in the immediate neighbourhood, the need to purchase concentrates and other needs from industrial sources, is entirely eliminated. Such external purchases are typically ten times more energy intensive than those we can produce in the neighbourhood by the PP method.

Creating awareness among the masses alone will expose the present hidden energy subsidies and the evils coming thereof.

These concentrates are factory products that need high energy inputs for transport, milling, storage and marketing. Similar is the case with fodder that is transported from a distance of more than fifty kms.

What applies for milch animals rearing, also applies for sheep or goat rearing and poultry maintenance. PP has now standardised various alternatives, so that the energy & commodity costs are entirely internalised, i.e. avoided by internally producing all requirements.

Our concept of Market Gardening thus includes new techniques for maintaining animal husbandry in the neighbourhood in a new way so that clear market returns, both in money and energy terms, are maximised.

5. Ecological Value additions :

We shall mention only some of them as follows :

1. Use value of 1 kg of wood and bamboo after processing and preservation treatment will exceed 2.3 kg of steel for a wide range of application. Durable building construction material to minimise the present requirement of steel is now more or less an accomplished fact.
2. Use value of 1 kg processed natural fibre and with appropriate blend of material will exceed the value of the one kg of synthetic fibre.
3. Latex adhesives etc. are already mentioned elsewhere in our present discussion.
4. Resins, bibe, cashew, lac have great potential for various applications (preservatives, adhesives, varnishes, etc.).
5. Fibres from banana, pineapple, silk cotton, tur-cotton, agave plants have great potential to enter in various useful products.
6. Biofuels enhanced by use of solar heat can meet the demands of process industry and match the use value of equal weight of gaseous or liquid fuels.

Exploitation of solar energy sources has been hampered by the comparatively high cost of solar thermal equipments, failure of supply on cloudy days and availability of solar energy for about 8 hrs per day and 250 days in a year.

Recent experiments on low cost spiral solar concentrator indicate that temperature of 300°C can be attained with low cost reflector surface costing about Rs.200/m². By use of appropriate Fresnel geometry, a trade off is obtained of quality of reflecting surface and reduction in cost. An output of 4 kwh/m² per day for 250 days appears to be the realisable goal for home application and large scale application.

The assembly is of 165 spiral concentrators of approx. 2 m² each making up a total area of 32 m²; the dimensions of frame would be approximately 3 m x 12 m.

Assemblies of 300 sq.mt. have already been reported to have performed satisfactorily in USA. In Germany small collectors have been used to run solar cooker any time in the day and for all purpose use.

7. Various chemical intermediates can be obtained from many suitable species of plant by extraction of concentrates or distillates of bio-mass.
8. Herbarium activities have a great potential for local quality pharmaceutical industries.
9. Large saving in transportation is, in essence, energy saving.
10. Possibility of use of modern information and communication technology to keep pace with the changing world outside. The implications of making consumers the producers of goods with less and less external energy inputs, are that the information will be used for qualitative upgradation of the production process or for creating awareness of

Some successful experiments in these directions are now being conducted at Bhusaval, Maharashtra, India.

P.P. is now venturing in these areas to replace the highly sophisticated bio-technology.

resource constraints in users and the imperatives of maintaining, enriching and enhancing ecological balance through human resource enrichment and enlightenment and optimum energy harvesting, conserving, investing and networking in grid systems to build rich energy pools to pumpout maximum entropy from the neighbourhood eco-system.

6. The New Agenda :

The new agenda in Market-Gardening will be critical recycling of various types of waste produced in the neighbourhood through bio-degradable processes, intelligently maneuvered as in “in situ composting” to have less external inputs, and to build Pearl Valley type mini-ecosystems as in China etc. There are infinite possibilities in this new sphere of waste recycling. Such recycling will go on adding new resource inputs for further spiral growth and evolution of the ecosystem.

7. Micro-climate Gardening :

In nature’s process of ecological evolution, Nature has produced various species capable of surviving in different climatic zones. Desert animals and plants are well known for having their own microclimate creation and resource recycling processes. Thus by burning fat and by harvesting water from it, desert animals can survive a long spell of drought. On the other hand animals in the tundra region have their fat and wooly cover.

The best example of nature’s achievements is the evolution of hot blooded animals. Hot blooded animals can control the temperature of their bodies by the thermostat arrangement in the lumbar part of their brain. Man has further improved these provisions through clothing and housing techniques.

It is now easy to extend these provisions to our Market Gardening system through the use of simple electronic gadgets. The present-day green-house technique requires a high external energy input. We can now eliminate such input as it happens in hot blooded animals, by copying the temperature maintenance mechanisms of such animals through new type of electronic gadgets to function as temperature and moisture maintaining system. This approach is going to revolutionise the entire agricultural system since by harvesting the solar energy and using some part of that harvested energy for creating micro-climate. Then instead of having to receive cold storage supply through transport system, we can afford to grow garden fresh fruits, flowers and vegetables in any part of the world, though these are at present grown only in some specific climatic zones to be transported to the far-off markets.

Micro-climate techniques are going to solve, once and for all, the need of cold storages all over the world. Also, the development of micro-climate technology will make it possible to bring the large desert areas like Sahara and tundra under green cultivation, round the year.

We, the Prayog Pariwar, are now working in this new sphere of Market Gardening, as in this endeavour, we seek not only to enrich and enhance the neighbourhood ecosystem in all aspects, but also to achieve a breakthrough in the agricultural practices all over the world, especially in the regions having unfertile or desert lands.

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Chapter 8 :

Neighbourhood Energy Network

- 8.1 Entrepreneurship
 - 8.2 Tool using needs energy
 - 8.3 The pyramid structure in eco-system
 - 8.4 Neighbourhood based industries
 - 8.5 Three categories of eco-systems
 - 8.6 The new eco-system -
eco-system of category four
 - 8.7 Energy networking
-

8.1 Entrepreneurship :

After Home Farming and Market Gardening, we turn now to industrialisation of the society. Before proceeding to this, let us consider the two important definitions of Man, viz.

1. Man is a thinking being.
2. Man is a tool using animal.

These definitions of Man put human beings, in a singularly unique position in the entire scheme of nature. Man has a deep and never ending capacity to learn and unlearn (with experience and experiments) and to preserve and carry on to the next generations the entire spectrum of earned knowledge and skills. Moreover man is always capable of achieving perfection in whatever branch of knowledge he is interested.

It is worth while to note here that even in the early period of human history Man developed archery to such a perfection that its references in Indian epics and mythology and even in history make one wonder how the early humans achieved all that only through empirical wisdom and practice. The ancient art of horse and camel use in war and peace, has still continued and though we have given up archery we have increased the range and accuracy in artilleries and missile firing. It is astonishing that our ancestors, without the present day scientific insight in theoretical material sciences and mechanics etc., were able to produce steel and glass of superb quality. They had then invented pulleys and used these in construction of various lofty structures. They had evolved and achieved highest standard in weaving (cotton, wool, silk and other fibres) almost to utter perfection.

Latest knowledge has become a new resource at the end of this century.

Tools are necessary to upgrade energy combinations.

Though the new power shift appears to be towards Money and Money Markets, the real powershift is towards information which is actually tending to replace money as a means to exercise power.

Since very early times the human race has shown that it has inherent innovative spirit and also the ingenuity to realise and use nature's boundless capacities with insight and understanding. Since early times man has striven to fathom the limits and possibilities in his natural neighbourhood schemes. With the progress of modern science it is said that now there is an explosion of knowledge in every sphere of life.

Unfortunately at present, the peculiarities of our formal education under schooled systems, create a situation by which the entire enormous fund of knowledge and thought resource, remains locked up with a few professionals and experts. To them it always remains a monopoly asset to foster their own individual well-being. Various peculiarities of the present day formal education systems are :-

1. Single point entry for enrolment.
2. Emphasis on syllabi.
3. Course studies.
4. Student teacher relationship.
5. Examinations.
6. Grades and certificates.

These features have nursed the evils of keeping our knowledge segregated, scattered, specialised, strangulated, and forever inaccessible to the common man.

To create an enlightened, enriched, decentralised, universal human base and further to shape a new modern industrial society in the neighbourhood of each and every village, the first and foremost work, that we have to promote, is to deschool the society. Our masses today need, not the government subsidies or multinational packages, to survive and progress, but only the tool of **Techniracy** (technological literacy) to help them on their own, to read and learn their neighbourhood problems and to deal with them successfully

The documentation of the discourse on "Prayog Pariwar" - Ultimate approach to Open Learning, held at Indira Gandhi National Open University, New Delhi, on 2-1-1996 is available.

through their own resources. With demystification of science and with deprofessionalisation of education (which is possible on large scale in near future, through computers and communication network), their learning would become the function of their everyday living.

The changing needs and goals of the present scientific age have urged them to seek on their own for their own techniracy to cope with their problems. Prayog Pariwar's venture formats, are seen to be capable of offering to each one of us, this new sociology of science with the right to decide what one wants to learn at what time in their life, with whom, how, how much and where. We have seen that it is always and everywhere possible to initiate, originate, explore, discover, formulate, build, accumulate, propagate and release various types of ventures to throw open the flood gates of knowledge to the masses. This new approach of deschooling society further conceives that the available knowledge potential in our present community is so great, that even with the investment of a fraction of this knowledge resource, it is possible not only to reshape the destiny of the entire world but also to channelise the latent creative forces of the underdeveloped, developing & over developed countries too.

It is not the lack of funds, but the failure to evolve a new system of learning for free and equal access to all kinds of knowledge forms to who so ever is in real need of these, that is making knowledge less useful to the community.

When the people begin to have a glimpse of de-schooled venture education, and begin experiencing how knowledge comes knocking at their very doors (not as odd sets of extension packages or practices, but as "ventures" that are functions of their real life situations), their latent choiceless awareness flares into self awareness and then to calculated risk taking capacities (i.e. venture capacities) in the respective fields of life.

It highlights the ultimate aim of education as bringing Equity (in all types of resource sharing) with Liberty (All type of decision making freedom) Fraternity (Solidarity in risk taking & venturing) to bring Prosperity, Peace & Progress to each one unto the last.

From the present Management driven society, the coming century will be Education Driven.

The filtered knowledge coming from the research laboratories and the universities to the masses as a 'Package-tool' neglects the dynamically and culturally determined relations with the neighbourhood. Because of this process of dissemination through schooled system, knowledge has not become a tool for social, cultural and economical change. Generation of Ventures as established by Prayog Pariwar alone provides these tools to each one as per one's capacities and needs.

Thus, in a sense, a new entrepreneurship develops among the masses that is the real core of an industrial community. This sort of human transformation adds to the total entrepreneurship in the community to make it more operative, expressive and functional. Then no knowledge or learning is felt superior but simply treated as different. Every one in the community has free access to whatever knowledge one wants to learn and use and is not barred from learning, simply because one does not fulfill some conditions of the schooling system.

Our experience in the scientific grape revolution in Maharashtra has amply shown that in such deschooled cells, each venture is eager to share his knowledge, insights, expertise, innovations and one's difficulties in the field with anybody eager to share and to respond by giving the necessary feedback and enter into further involvements. They thus build up a new common trust of knowledge reserve and a real fraternity of knowledge. It begins to function on its own as an alma-mater in respective faculties of knowledge. The community is thus freed from the present schooled system of education in a non-structured way and the society is free to draw upon form of knowledge (from any branch of science and other faculties) at any moment and for any cause.

Thus, to build up a truly prosperous industrial and highly scientific and technological society in the neighbourhood of every rural setup, the first and foremost need of promoting entrepreneurship in a non-structured way can be achieved by making all the latest knowledge resource base available to all in a deschooled manner.

8.2 Tool Using Needs Energy :

The second definition states that man is a tool using animal. Any tool using necessarily implies energy use. It also needs various organisational skills.

Thus bullocks can be used for cultivation of soil, for transport of goods in bullock-carts, for drawing water from wells, for crushing oil seeds, sugarcanes and for converting their animal energy into electricity by means of running the generators. Thus every time with the development of new tools, new space is created for additional resource or wealth generation. Our present system is full of such instances after the advent of transistors and integrated chips. The present technological, scientific and industrial society has its roots in the inherent human capacity to design and handle tools with superb skill and dexterity.

Village industries, small scale industries, large scale industries are entirely human endeavours. Ecosystem evolved through natural phenomena does not include flour mills, oil mills, textile mills, dams, power projects, cement and steel plants, and atomic reactors. Man has developed new techniques of energy, networking such as electricity from light through tools like photo electric cells, which green plants of the natural ecosystem cannot generate. Thus nature, by making man a tool using animal, has given him an edge over its own system. In nature's scheme the reasons for this must be evolutionary. If mankind tries to grasp these reasons and tries to apply them a new era of making every village a mini-universe is sure to dawn in the near future.

Let us now study how man has so far manipulated the available energy systems to supplement his tool-using capacities. According to current thinking, an economic activity is geared to four factors of production :

Land, labour, capital and entrepreneurship.

We have already studied the fourth-entrepreneurship, and the way to build it up in the community. The first factor "land" implies the neighbourhood natural resources - biotic and abiotic. With Farming and Market Gardening we are optimising and stabilising this factor in our neighbourhood.

The real emphasis to bring prosperity, peace and progress at each door steps is networking Sun's energy and upgrading it in the neighbourhood in a manner similar to that of eco-system building by nature through its food chain.

In an eco-system, suppose a hen consumes food (grains etc.) it produces all its needs for its survival, health and happiness and for reproduction as flesh, bones feathers eggs etc. In a way in nature's food chain in consuming one thing new things are produced by the user building new products out of the old produce. It is in a way consumer producer (Prosumer) way of living.

In our energy systems we can imitate these nature's ways in its food system to build pyramid of energy at all decentralised places leading to photovoltaic electricity as well as hybrid solar thermal electricity with real energy gain regeneration capacities.

The second factor "labour" really signifies not only human energy input but the total energy input in the process of production. Thus the energy networking in the neighbourhood in other terms is but neighbourhood industry networking.

In the prosumer society there will be no labourers any more and each individual will be both producer (processor and owner of eco-potential) and consumer, using different kinds of energy available in the neighbourhood.

In the early period of human history individual labour and family labour (or of the tribe) were the only assets. Later household work was taken as shadow work and still labour of serfs and slaves was sought to have sure supply of human energy for tool-using and for feudal agricultural system of production. The knowledge of fire also helped our ancestors to get help of biofuel energy of the eco system. The use of animal energy in agricultural transport and other activities further enlarged capacities for more wealth generation or for better transportation. Later the use of wind energy to drive ships was a new breakthrough. Next came steam locomotives and then followed the era of fossil fuel use and of electricity and of atomic energy. However nowhere in the system the energy used was fairly priced and paid for. On the other hand it was exploited to create surplus profits for the owners of the system. Till today, as we have seen elsewhere, the industries get all their energy at highly subsidised rates, and in terms of eco-economics, at false rates as compared with energy equivalence rates.

In the prosumer society most of the industries will be located in the neighbourhood, since in nature's scheme the real energy pools or grid can be well established only at decentralised levels. Before proceeding to this discourse let us first compare nature's ecological energy chain and that of man's science based energy chain.

8.3 The Pyramid structure in eco-system :

In nature's energy scheme there is tremendous metabolism going on every where in the living world that uses energy from the food chain to pump out entropy in the system and to build up complexity of the organisms - small or great. There is a constant flow of information in it regarding the external and internal environment of the organisms.

When it comes to evaluating the rate of harvesting the sun energy three autotroph organisms and the rate of energy flow from autotrophs to heterotrophs as also the rate of nutrient exchange, it is important to know how fast materials are moving along the pathway between organisms and environment than to know the total amount present. (it is the velocity of circulation that is important in running the cycling symbiotic complex chain). We can elucidate this with an apt illustration.

Consider the situation when earthworms had not evolved on earth. At that time the decomposition of organic waste was possible only when in some part of the year the conditions of temperature, moisture and PH were favourable for the microflora to live and work. But when earthworms evolved they could go deep into the soil by burrowing and create proper conditions of PH, moisture level, warmth in their intestines. Thus earthworms became nature's microflora culture units and the rate of biodegradation increased many fold. Moreover earthworm consumed the dead bodies of these microflora and also in a sense were farming the spores of the bacteria, actinomycetes and fungus. Thus the symbiotic link between the two helped in having faster rate of turnover and better level of evolution and so further the enrichment of the ecosystem which would not have been there without earthworms in the organic recycling scheme of nature. The entry of the grass-eating animals, such as cows and buffalos, further hastened the process of biodegradation of grass into dung, very much relished by the earthworms as food, and thereby causing rapid growth in the number of earthworms.

Human energy networking systems have devised various types of tools other than only chemical tools as in food chains.

This symbiotic support to each other by earthworms and grass-eating animals accelerated the improvement in fertility of soil.

As man is at the apex of nature's scheme and is a tool-using animal, man has helped the eco-system by creating more support value on lands where there was underground water but it was not earlier available for cultivation of any biota.

By digging wells and by using bullock to draw water and by cultivating land to support both the bullock as well himself, man first harnessed the energy of the bullock to increase the energy level of the eco-system.

Thus human endeavours that include science and technology are capable of utilising various forms of energy to pump out entropy and build up more information communication and complexity in the entire eco-system. The term economics is derived from the word oikonomia which means the management of the household. Nature has evolved the entire eco-system on the earth through the increase of its original energy reserves through green plants and then employing the very same augmented energy to establish food chains to enhance further the energy-value and use-value of its resources for supporting various complex incoming generations of flora and fauna of the system.

Unfortunately at present, man's impact on the eco-system is switched to increase entropy and disorder. The rate at which the energy is harvested through the biotic component does not match the rate of energy loss through the burning of fossil fuel. If we can compel the users of fossil fuels to recycle the carbon dioxide released in the environment, by recovering it in some form of biofuel, in a sense we would be increasing the turning value of the eco-system. As the trapped up solar energy in fossil fuel is put to use by men as a tool-using animal, (which would not have been otherwise possible in the present eco-system), this use of the fossil energy can be viewed as increasing the complexity of processing industries, as also of the communication and transport system. Thus in a sense we would have promoted better life for the entire human race.

This use of fossil energy can well be seen as pumping out entropy and building up new avenues of growth in the neighbourhood eco-systems for the time being. Thus instead of getting frustrated over man's recent failure in enriching and enhancing the present eco-system we can still be hopeful of operating a threshold switch to put our entire economy on a new footing of eco-economics for generating and gathering further lasting effects.

Let us now study and compare nature's energy chain, i.e. food chain and man's energy chain that includes shadow work of house wives, social workers, slum system, serf system, slave system, use of bio-fuel, animal power, power from fire, coal, steam, water flow, wind flow, hydro-electricity, thermal power, solar panels, and atomic reactors.

In nature's food chain there is a pyramid of life. The strategy of nature is to diversify but not to the extent of reducing the initial ecological potential in the system. Ecologically similar and ecologically equivalent species have evolved in different parts of the globe, where physical conditions are similar. However it has a holistic make-up and it tries to preserve environmental health.

In nature's food chain, enzymes are biological levers, pulleys, inclined planes and fulcrums.

Thus if there were only forests but no animals to consume the products of the autotrophs organisms, the forest would be aging and then forest fires would (and do) burn the forest to raise the same system again. The present day fires in yellow forest are nature's own ways of keeping environmental health. But nature however evolved a system of food chain in which herbivores consume the autotrophs and build up complex organic advanced life. The predatory animals survive on herbivores and through such linked consumptions food chains, various new products are built up and in turn are used to build a further new chain. Thus the species go on evolving and in the forest the species similar to tigers are taken as the token of the measure of the strength of the pyramid of life in the forest.

Thus if hundred tigers survive in a forest then it is ten times, qualitatively, higher up than the forest in which only ten tigers can survive.

Thus, understanding the pyramid of life structure in eco-system makes us understand the pyramid of energy system in the agro-industrial sector of human activity.



For example, the shepherds in Maharashtra (India) keep moving from one place to another throughout the year with their flocks of sheep. They plan the route in such a way that the climate of the place will be congenial to the flock. But in so doing they harvest the sun energy conserved by the growing grass every where in the country side. The daily droppings and urine of sheeps rebuild the fertility of the soil. If the shepherds had not evolved this system, the grass would not have been converted to higher value complex food - the flesh of the animals. In nature's pyramid of life such close harvesting of the sun would not have been possible though the animals would have migrated in nature's eco-system.

Thus man can enrich and enhance nature's eco-system through his agricultural, horticultural, sericultural, and similar other activities.

In his immediate neighbourhood he can raise many primary products for further industrial growth. In a sense agriculture is human autotrophism at the best level.

In the pyramid of energy levels in industrial system, there are four clear levels. Each one at the higher level is superior in some respects to the previous level and at the same time dependent on it .

1. The first level is of weak energy, that is energy of the type we receive from the sun.
2. At the second level we have intermediate fuel type energy that can yield us high temperatures upto 400° C.
3. The third level of energy is high temperature yielding energy that achieves temperatures above thousand to two thousand degrees centigrade.
4. The fourth level is of clean energy which is handy and captive like electricity, which is without associated harmful by-products such as ash or smoke or radiation hazards.

Just as each further stage in the pyramid of life is of higher denomination in terms of energy required to preserve characters, so also each type of energy at higher level is of a higher energy consumption level than the previous one. The hierarchy of energy levels can be illustrated as follows:-

1. Energy of the sun (lowest level).
2. Fuel and steam energy.
3. Energy of high temperature furnaces.
4. Clean energy such as electricity.

Let us now consider some of the new possibilities in establishing various levels of neighbourhood industries.

8.4 Neighbourhood based Industries

1. List of some of the industries.

In primary level industries we include those industries which harness the energy from the sun or human or animal power.

Primary Level Industries :

1. Agriculture and infrastructure development industries such as construction industries, water provisions and storage and pumping and delivery facilities.
2. Production of bio-fertilisers and waste treatment and recycling facilities.
3. Fuel saving devices and methods.
4. Consumer industries, textile and other fabrics, use of jute maesta (ambadi), sisal, ramai, sunhemp, cotton, wool, silk.
5. Preservation, seasoning and processing lignocellulatic biomass such as wood, small timber, bamboo.
6. Herbs, pesticides, resins, oils, latex chemical from sugary juice.
7. Paper production, production of industrial alcohols, acetones, from agro wastes, tubers, and from variety of sorghums etc.

2. Secondary Level Industries :

(Unpublished data - Dr.K.R.Datye)

In secondary level industries let us tabulate input supply and energy needs, for creating temperature levels from 300°C to 400°C high pressure facilities.

Bio-derived inputs and recycling wastes	Energy needs and source
1. Processed bamboo and wood and adhesive and preservatives coating with easily available chemicals & resins.	Heat for seasoning and processing mechanical electrical power for press & fabrication equipments. This can be mainly supplied by steam generating plants.
2. Fibre composite with cement and limited quantities of resins to replace cement, asbestos product and structural components. The basic product for cements can be had from wastes such as rice husk.	Heat & pressure which could mainly be supplied from steam generating plant.
3. Fibre based industries, mainly industrial fabric for soil reinforcement, silver fabric composite membrane.	Mechanical power for operating spinning equipment, non-woven fabric and thermal bonding as well as bonding with adhesive, heat and pressure.
4. Calcium silicate bricks based on lime and fly ash (a waste product)	Heat and pressure- mainly steam-to be used.
5. High strength cement ceramic & composite and glass fiber technology (Rice husk ash and bagasse ash are good sources for amorphous and colloidal silica, many ferrocement products.	Solar thermal units as described elsewhere. Solar and biofuel furnace.
6. Bio reactors to produce chemical intermediates from sugary juice, tubers, latex & resins.	

Composites of natural fibres, cement and colloidal silica obtained from bagasse and rice husk can produce inter-locked fibre products that are non woven (by using judicious combination of needle punching & resin bonding). Processes of vacuum moulding & acceleration of curing using solar heat at lower cost are possible.

Non-woven fabrics have a very good potential for several industrial applications and low cost natural fibres such as banana and pineapple can very well be used. These fibres can be strengthened by high quality natural fibre/yarn obtained from ambadi (mesta), ramie, sisal etc.

1. These are useful in membrane for seepage control on farm ponds, irrigation channels and effluent treatment facilities. Low cost, low loading films can be used in combination with protective base layers and covers of non-woven fabrics to minimise the puncture hazard.
2. Non-woven fabrics will facilitate significant quantity of clean filtered water for domestic, industrial & agricultural use.
3. Lime impregnated geocells & strips would be used to improve poor soil for road subgrades and for embankment.
4. In combination with bitumen and latex, non-woven fabrics can be used for improving the performance of road surface.
5. Large quantities of low grade silk, wool can be used for composite fabric as cover for various consumer products and as blankets, rugs etc.

Thus with fresh scientific and technological insight in various biogenic products and novel processing methods a new industrial community would emerge with a new type of neighbourhood energy networking.

For real decentralised industrial progress what we need is a judicious adaptation of nature's system of pyramid of energy in our neighbourhood.

8.5 Three categories of Eco-systems :

In the discussion so far our emphasis was on new system approach to replace the present green note structure of the society by the green leaf structure.

Our new currency will find its sanction not against the gold stock with the government but against the constant enriching, enhancing turnover of energy in the micro and macro neighbourhood all over the countryside-in every nook and corner.

At first the human race was mostly Nature fearing and Nature worshipping. Later it became mostly Nature trusting. The recent change in it's approach is towards being increasingly governed by Nature-knowing, Nature-understanding. In the near future we have to make it more Nature linking, Nature friendly, Nature creative and holistic too. In this new approach we visualise a new type of society participation to realise greater enrichment and enhancement of the neighbourhood ecosystem through this new vision in energy networking.

Prior to human evolution on the Earth, there were two categories of ecosystems, when classified according to the source and level of energy.

1. **Unsubsidized solar-power ecosystem or ecosystem of category one.**
2. **Naturally subsidised solar-powered ecosystem or ecosystem of category two.**

In the first category, although the total solar energy impinging upon earth is enormous, solar energy insolation per unit area base is a dilute energy source. Because only a small portion of that which falls on a square meter is directly usable by organisms.

The open oceans, large tracts of upland forests and grass lands and large deep lakes are examples of relatively unsubsidised solar - powered ecosystems. Naturally these low powered ecosystems have a low productivity or, in stricter term of mechanics, low capacity to do work.

However from human point of view this low powered ecosystem is of immense use. It is the basic - life support module where large volumes of air are purified daily, water is recycled and purified, climate controlled and weather moderated.

In the second category of ecosystem, the power density is raised to an order of ten times the first category. Thus in a coastal estuary the ecosystem is subsidised by the energy of tides waves and currents. This back and forth flow of water does the work of recycling mineral nutrients and transporting food and wastes. As a result the organisms in the estuary are able to concentrate their efforts on more efficient conversion of sun energy to organic matter because of the greater availability of nutrient matter brought from outside and better recycling of this organic matter. The other examples are of wind and rain in tropical rain forests, the flowing water of streams and the migratory birds from other part of the globe. Thus ecosystem of category two has not only high life support capacity but can produce excess organic matter that may be exported to other systems or stored. In terms of energy values, the estimated average amount of energy flow in kilo calories per square meter is about two thousand per day in the first system while in the second system it is ten times i.e., about twenty thousand kilo calories per day.

The third category of ecosystem emerged when man first came in the picture. Man learned how to modify and subsidize nature for raising productivity through land culture and water culture. In primitive times human and animal labour were put in various agricultural, transport and service operations.

Then the farming system, now called organic farming, emerged. In this system, all animal and human wastes were recycled in the neighbourhood vicinity and on farms. In the coming new ecosystem, called neighbourhood energy networking ecosystem, man with increasingly better insight into nature, through science, is going to subsidise the present

Empirical combination of resources through accumulated wisdom of the ages as seasonal sowing, water resources created through diverting flowing water, obstructing flowing water, drawing water by animal labour, digging wells and networking organic wastes for organic farming etc.

ecosystem to flourish with his own progress. Prayog Pariwar visualises a new era of eco-neighbourhood as the next phase of the coming scientific, industrial, technological society. This would be the fourth category of ecosystem.

8.6 The New Ecosystem of category four :

Before considering ecosystem of category four, let us first consider the present per capita consumption of energy in the advanced countries. It was estimated in the year 1970 that per capita consumption of energy in USA per year was about 87 million k cal. An adult in that country consumes about 2800 k cal of food energy daily. This comes to about one million k cal per year per person. Thus out of 87 million k cal of energy consumed per capita per year, the energy needed for physiological needs was just about one percent. The other 86 million k cal of energy consumed by the person was fulfilling his other needs of high standard living. These included various industrial products and services such as transport, communication, lighting, clothing etc.

Now if the population of USA had been eighty seven times the population in 1970, each one in the picture would have hardly shared bare meals. As also on the other hand each one was having a captive labour (in terms of energy units) of eighty six persons at hand with him to do various types of work he wanted to do. In other terms the kilo calories of energy that annually flow through a square meter of an industrialised city have to be measured in millions at present.

In nature's category-1 ecosystem (the most productive photo synthetic system of plants) it is only about fifty thousand k cal per square meter per year and only in our most productive systems in agriculture we reach this value.

Since man has enough ingenuity to modify and subsidise nature's original power system the new category of ecology will necessarily be a new type of urban industrial system

Knowledge of real nature of energy that it can exist in any of the many forms, heat, light, electricity, sound, gravity, mechanical animal energy etc. and conversion of these from one form to other in energy equipment ratios only, is gained by us only a century and half ago.

* This has given us an opportunity to work with nature to network more and more daily incoming solar energy to further the present evolution of ecosystem three to four five and so on.

Our venture networks are now after erecting one mega watt electricity generation by networking neighbourhood resources for local use (household use) and then additional electrical energy marketed outside market through grids. (use in small & medium industries)

wherein the energy flow will be used only for pumping out the entropy from the neighbourhood through well supplied bio-fuel and other type of local energetics such as concentrated solar energy through lenses. As all this energy is available only in a decentralised manner we will take our potential neighbourhood as that much area, as will provide within the neighbourhood, for each individual thirty coal units of energy per day. (i.e. 210,000 K Cal.). This is more than matching the energy that is daily consumed by each person in Japan or USA at present.

8.7 Energy Networking :

One coal unit is the potential energy in one kilogram of good quality coal. It is about 7000 Kcal. Thus the biofuel energy that can be harvested in one square meter of area will be about seven coal units per year. So to earn 30 coal units per year, we will require about 4 square meter of area for biofuel conversion. If we multiply this by 365 days in a year, each individual will need about $365 \times 4 = 1460$ Sq. meter area in the neighbourhood to earn 30 coal units of energy per day to match the energy consumed in the industrial society. That is, for a family of five it will be about 7300 Sq. meter or less than two acres of land in the vicinity of its residence. Continuing along the same lines, a village of 100 families will require about 400 acres or 160 hectares of waste land, to harvest the solar insolation which will suffice for leading the kind of prosperous life implied by the indicated energy consumption. But with recent pilot studies it is becoming clear that 1 MW electricity co-generation plants with solar hybrid concentration and combination can be established with 150 biomass acres of land energy gain in the neighbourhood.

Experiments are now in progress where the energy expended in watershed projects is then shared by the community, where the energy cost of water conservation in the locality and the energy cost for water storage and transport for family needs is to be returned in equivalent biomass terms. 1 unit of electricity equivalent to 1 kg of any type of bio-mass (dry matter)

Refer paper in appendix.

Thus our scheme of Neighbourhood Energy Networking is more viable than the present urban -industrial-externally-fuel-powered system. The urban-industrial-externally-fuel-powered-system is in a sense an heterotrophic industrial

system whereas the neighbourhood fuel powered system is a genuine autotrophic industrial system. Even the low powered first category of ecosystem can support a network of industry if it will have an extensive neighbourhood of about a hundred villages. For fertile lands and places located near coasts, large estuaries, large rivers where life support capacity is high, the micro city planning of even fifty villages will be adequate. In such a system the present energy consumption in transport of raw goods and finished goods to far off distant places will be mostly eliminated. Out of the total energy expended in the transport system only ten percent is useful for load carrying.

Various other benefits similar to these can be defined as follows :-

1. The hydrocarbon energy system will be replaced by renewable carbohydrate based fuel, cracking of latex and oils to give petroleum based products, (intermediate or final), use of alcohols as fuel etc.
2. Sun powered heating systems through concentrated sun energy, through lenses and conserved as high temperature oil in insulated systems.
3. Harvesting wind energy during monsoon to raise water from low land to upland and to add to the potential energy of the conserved water and make it available later through various water carrying systems.
4. Water conservation in situ and in catchment areas to enhance the productivity of the locale.
5. Well established forests and uniform 30% cutting every year after the canopies of the trees merge.
6. More credit potential as goodwill and in kind than in cash.

7. The present industrial system is a great consumer of energy and makes sub-optimum use of scarce commodities. This picture will be changed in the Neighbourhood Energy Networking for further industrial growth.
8. Animal energy that can be added to the scheme of things for the ecological growth through animal use, will be at least ten times the energy investment in keeping animals. To give an illustration, water in the Koyana reservoir is generating electricity by losing its height. Now if the water at lower level can again be raised, by say a team of thousand bullocks to the height where sunlight cannot be harvested for want of water, this water will again raise biomass to feed the bullocks and also to feed the people as also to feed the industry. The bullocks need not be employed in the old fashion but a grid can be established where animal energy will be converted mechanical energy and then to the electrical power through generator. Thus in Neighbourhood Energy Networking lost energy will be recovered in one way or the other through nature's schemes.
9. External inputs like pumping of water can be accepted for the time being and then paid back in terms of equivalent biofuel energy in one or two years with due interest.
10. Biomass waste recycling will be a profitable industry in the neighbourhood and can be a real addition to the total fertility level of the ecosystem.
11. In the present ecosystem, forests also harvest the sun only for a part of the year because the photosynthetic activity of leaves is not the same throughout the year. As leaves mature and become old, no photosynthetic activity is carried to the optimum. With human ingenuity this canopy management can be so ordered that we will harvest the sun energy uniformly throughout the

year and not for a short period of a couple of months in a season. It will increase bio-mass production by at least four times that of the present. Moreover the coming era of polyhouse technologies and genetic engineering is going to increase the present photosynthesis rate of biota at least four to six times the present rate.

12. These and such Neighbourhood Energy Networking will also produce surplus energy to support grid system that feeds energy to the R & D (Research & Development) section of the society.

It will then support the highly technical projects such as satellite launching, space probes for making other planets in the solar system more human-friendly through new equipment such as solar panels. All this progress through the advancement of the present science will build up a new type of composite enriched eco-system that we may term as eco-system four.

To make each neighbourhood (i.e. Village) a part of a well-knit ecosystem of category four is to make every village a prosperous mini universe. Prayog Pariwar (P.P.) Methodology is extending this promise to the coming generation.

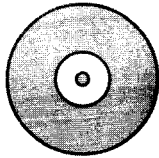
Without the initial formation of glucose, no networking of food chain in the ecosystem can come up. In a similar way, without decentralised optimum bio-mass production & conversion of solar insolation through hybrid solar thermal electricity generation, at each neighbourhood, no universal, complex type of decentralised, humane, industrial growth through venture generations in various areas of life, for health and happiness, is possible.

Prayog Pariwar's approach is based on developing the capacity to Dialogue with Nature, which is an informal, intimate, involved, heart to heart chat, with all the various Neighbourhood Resources continuously to network and harness their potential.

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A Digital Interactive version of this current book on CD - ROM enhanced and enriched with more pictures, audio and video components is in production.

Forthcoming Book :
" New Visions - Natueco Culture in City Farming & Minimum Resource Right per family of five".



APPENDICES

1. Homestead Wealth for All
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| <ol style="list-style-type: none">9. Paper on 'Eco-Human friendly Decentralized Progressive Agro-Industrial Prosperity', Dr.Ambedkar Academy lecture, Nasik, 1996, is available. |
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Paper Presented in the Regional Conference
"Redefining the Good Society"
Indira Gandhi Memorial Trust, New Delhi.
17th, 19th Dec., 1994

HOMESTEAD WEALTH FOR ALL

Some findings of Prayog Pariwar

- S. A. Dabholkar.

INTRODUCTION :

Equity, Liberty, Prosperity for each and every individual is a realisable dream in the near future. The real core of any development is venture generation amongst the masses. Prayog Pariwar (P.P) has by now well established that with the investment of relevant Modern Science amongst the masses as per each one's needs, it is possible to create ventures amongst them. The only process needed is to demystify knowledge and science in the common idioms of the people. With this new foresight and vision, P.P is striving since last forty years to achieve this new goal.

Some of these findings of P.P. were first presented by me in 1974, at Cuernavaca (Mexico) in the international seminar on " Pitfalls of Deschooling Society" organised by Dr.Ivan Illich. Later most of this work was incorporated in German Language. In 1978 I was invited by Kassel University, West Germany to give a thorough exposition in a three day discourse on "Science for Rural Development". The exposition started with my key note address on our work and later along with me, Dr. Paulo Freire the eminent world famous educationalist on pedagogy of the oppressed, also took leading part in conducting these discourses. Recently in 1990, I had an occasion to put these findings in brief, in my short speech made at the occasion of receiving the Jamanalal Bajaj Award, for application of science and technology for rural development.

2 Venture development amongst the masses

The term venture is in a sense akin to what we term in economics as entrepreneurship. It is the calculated risk taking capacity in the individuals to solve their problems in their real life situations. It is possible to devise ways to invest the best of modern science and knowledge amongst the masses to increase their risk taking capacities within their neighbourhood resources through a new type of high standard resource literacy P.P.calls this process as knowledge networking in the neighbourhood or K N N - where K is for knowledge N is for networking & N for neighbourhood. Fortunately the progress in present informatics has made this networking work more universal as well as more impersonal too.

The present scientific grape and horticultural revolution, amongst the small farmers in the drought prone areas of Maharashtra has its deep roots in this approach of P.P. With this process of demystification of latest science in Plant physiology, Viticulture, Biochemistry to small farmers (one to one and half acres), the farmers have now developed their own techniques for getting assured, quality yearly record yields. They have now captured the national and international markets for their produce and are fetching highest prices for these.

With this unique success with small farmers, P.P is now experimenting with many group and individuals, the new thesis “ Homestead Wealth for all”. Thereby we hope to establish, a new era of decentralised higher middle class prosperity for each one in the society and unto the last.

3. The new resource literacy :

The growth of plant physiology, biochemistry and electronics in the recent past has brought forth the following important principles of neighbourhood resource enrichment and enhancement with the least of external inputs.

- 3.1 Sun is the basis of all ecological produce. Agriculture is a part of it. Sun is the major source of energy on earth. So real development is possible anywhere if one can harvest, conserve, invest, upgrade, utilise, use and slowly consume the once harvested sun energy.
- 3.2 Only mature green canopy of leaves of plants can harvest the sun energy. So greening is the first phase for within development at any place that receives full or partial sunlight.
- 3.3 If the incoming sunlight is not harvested the very day, it is lost for ever. Most of it is radiated back in the universe, the very night.
- 3.4 In India every square foot of area receiving 10 hours daily of full light receives 1250 K. calories of solar insolation. This if harvested the very day, will provide one time full meal of an adult.

But the mature green leaves of the plant can harvest one to one and half percent of this total energy received. So only three to four gms of dry matter (equivalent to 12 to 16 k.cal of energy) is produced by green leaves of plant.

- 3.5 The first dry matter produced by leaves of plants is glucose. All other vegetable and animal products, the living world uses, are produced by further processing this first product. Thus the harvested sun energy is widely conserved, invested and upgraded.
- 3.6 To harvest 3 to 4 gms of drymatter from the sunlight falling on one square foot of area, the green canopy area needed by plants, is five to nine times this area.

It is called the index number of leaves of plant. People can be made to understand and learn these various aspects by demystifying the relationships in their idioms & analogies.

3.7 The fertility level of any soil can be enhanced and maintained by recycling all the available biodegradable waste that can be gathered or even raised as weeds and compound trees. It is easy to impart this basic resource literacy to all, through simple and straight experiments.

3.8 Prayog Pariwar, has by now well established that to harvest one guntha of sunlight the fertile soil needed will be minimum 100 cu.ft. and maximum 160 cu.ft. So it is not necessary to improve the tilth and fertility of the entire nine inches of soil in that area.

This equation reduces to 2.5 liters to 4 liters of fertile nursery soil to harvest one sq.foot of sunlight. With true insight in these new aspects of soil, the drudgery of work in fields is totally reduced.

3.9 The water needed for optimum harvesting of the sun energy, over ten guntha of land is per day, 500 liters of waste water for the family of five.

3.10 By learning to get assured, record yields from various crops, the total monetary wealth generation by harvesting ten guntha of land on scarce waste water, (as modern science promises) is to the tune of fifty thousand rupees in one year. This amounts to high middle class level of living of the family.

As rural people know their plants and the life cycle of their plants through their own experience and observations, learning to take record yield is quite a joy to them.

With such internal development, through new resource literacy, the needs of the family of five regarding food, fuel, fertilizer, fodder, fiber, flesh, farm house, farmpond, farm work, house free time and freedom is promise for all.

We call this Homestead Wealth For All networking.

4. CONCLUSIONS :

The reasons for our present dilemmas of poverty pollution etc. are due to

1. Polarisation of knowledge and science through schooled system of education. The true remedy is not only open universities run by Govt. supports but open universities supported only by the masses.

It is an acid test, whether our knowledge dissemination process is as per every one's demands or for a few only.

2. Shadow work is still a system on which our slums and villages are forced to live. If each family of five gets the right of ten guntha of sunlight and assured daily supply of water of 500 liters per family and latest science in a demystified way, the scope of enormous wealth generation on this waste water of the family is bound to be tune of higher middle class living.
3. The whole of ecological living (inclusive human living) and all our industrial processes run on pure energy currency and not on money system currency. At present the energy is never priced in energy equivalent terms but is highly subsidised (One man's day work energy is equivalent to one unit of electricity which is priced one rupee per unit at the most, while man day energy is priced at 30 Rs. daily as minimum wages. Why should not clean energy like electricity be so priced). Unless our present economic system will establish parity between the two, the hope of creating equity in our social system is to remain a myth.

But by creating minimum resource base for Homestead Wealth for all, P.P has established that the promise of science when taken to the last man will make each one as rich as a person in Japan.

The prosperity level of a nation like Japan when measured in terms of energy units is 10 electrical units or 10 coal units per capita per day. By learning the process of efficient harvesting of sun energy by three or four tier system of eco farming one can daily harvest this much unit of energy from an area of 2000 sq.ft. That is by harvesting optimum daily sunlight on ten guntha of land for a family of five we hope to achieve this prosperity, that is enjoyed by each one in Japan, every where in India and else where in the world too.

Sun energy is a decentralised energy and the only external input, if at all the rains are scanty, is external water resource, which is very easy to arrange. This water will harvest hundred times the energy needed to conserve and transport rain water from near by places. The era of polyhouse farming, of new high yielding varieties of crops through genetic engineering etc., is then to be an additional boon for all, for garden fresh, pond fresh, and oven fresh products, and industries raised in the neighborhood by sharing of the enormous wealth generated in the neighborhood.

In short, true development, for liberty, equity, prosperity is possible through enrichment of neighborhood resources (Natural and institutional) through ventures, generated by enlightened human grey matter revolution, with the investment of the latest science amongst the masses.

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- Invisible Open University -
The First International Conference
Open University System and Development
16th to 19th Feb 1994.

APPROACH OF PRAYOG PARIWAR (P.P)

in field Oriented Research Development in Agriculture.

S. A. DABHOLKAR

A B S T R A C T

The natural resource development of any nation truly rests with its agricultural development. Most of the raw materials needed by various industries come from coming to an end one major source of energy will be mostly renewable energy from Carbohydrates. (oils, alcohol, coal, wood, gasifiers). In near future most of our economic activities (Local & National) will be mostly empowered by harvesting & conserving sunlight through the green leaves to combine carbondioxide from air and water from the soil. Agriculture by now has changed from mere occupation to an highly advanced industry.

India is a country mostly of villages and small farmers. If agriculture is to be an industry in the present age, the most advanced, scientific knowledge in agriculture, biochemistry, molecular biology, plant physiology etc. Must reach the grass roots people working in the fields. Open Universities, especially those in India, have a big role to play in bringing about this revolution. Prayog Pariwar is a pioneer in this field, in the State of Maharashtra. P.P. has by now successfully achieved the networking of the most advanced scientific knowledge through participatory learning and innovative experimentations amongst the small farmers. The present paper deals with various aspects and findings of P.P. in leading and propagating various field oriented research developments in horticulture, agriculture and also in many other areas of our life and living.

INTRODUCTION :

The emergence of Prayog Pariwar has a long history of more than forty years. The thesis of the new approaches of P.P was first critically presented by me in 1974 in the international seminar on 'Pitfalls of Deschooling Society' at Curnavaca (Mexico). This was at the invitation of Dr. Ivan Illich, who found some very close resemblance, in his thesis of deschooling society, and in P.P's method of successfully networking advanced scientific knowledge, amongst the masses, at their door steps and even in their fields in a decentralised manner.

Later an exhaustive paper on P.P. was incorporated in German, under the title 'P.P. the Network of Knowledge Communication and Learning Exchange'. In 1978, in Kassel University, West Germany, there was a three days seminar on science for rural development. I was invited to give the keynote address and spell out our approach on P.P. and then lead the discussion along with Paulo Freire. The work of Paulo-Freire on the Pedagogy of the oppressed and P.P.'s approach of demystification of science, deprofessionalisation of education and venture generation among the masses were on the anvil of the dialogue for critical scrutiny and understanding.

The word Prayog signifies 'experiments' and the word 'Pariwar' signifies 'sense of belonging and togetherness' till the success in the experiments is achieved. This is a new type of fraternity (brotherhood as well as sisterhood) in yearning for advanced scientific knowledge, and using that knowledge to experiment and innovate on one's own, to achieve success in resolving the problems facing them.

The present graph and other scientific horticulture revolutions in the drought prone areas of Maharashtra amongst the small and marginal farmers (with about half an acre to two acres) is deeply rooted in this process of self-study and experimentation.

Now they have built up a yearly turn over of more than five hundred crores of rupees in the state. Thirty five years ago credit of Rs. five hundred per acre was not available to them. But now as the graph growers are getting assured record yields (as assured as in well established industries) the banks are prepared to advance to them Rs. Sixty thousand per acre on long term basis.

They are now on their own, getting further organised for foreign exports, and for various processing industries. They have achieved all this through self-study, experiments and ventures in the field. For this they spared no latest research level knowledge from any where in the world. With their original experiments they translated all this into success within the limitations of their real life situation. There is no dependence on government, for subsidies or on agricultural Universities, to carry on the much needed original research to resolve their problems. In this sense it has been a true model of within development and from below. How with the various approaches of P.P. they have all together emerged as a powerful full-fledged wealth generating cell in our state is an exciting story. P.P. has by now well established that with the imputes of advanced scientific knowledge amongst the masses, the latent creativity and the risk taking capacity in the community becomes functional. This creates new entrepreneurship in the community at large, which is the real core of development. Now P.P. is participating with tribal people, with N.G.O.'s for earning high middle class level of living for a family of five on about ten gunthas of (about one tenth of hectare) waste land on rain water only, through these new approaches and techniques.

The new concept of city farming is also gradually developing amongst city people to harvest the sunlight on their terraces, in balconies and walls of the building to procure assured record yields in various agricultural products (fruits, vegetable etc.) which they need fresh for their family consumption.

P.P. has now become a sort of invisible open university not only to the agricultural community but to venturers in other areas of life too.

THE BASIC APPROACH

In this age of information and knowledge explosion the need of the hour is to explore, establish and propagate a new sociology of science and education. At present the advanced scientific knowledge is the real engine of economic growth, prosperity & wealth generation. But such knowledge is defunct unless it is properly invested amongst the masses to create a real development ethos and entrepreneurship in them. Unfortunately the present education system keeps more than eighty percent of population outside the ken of learning any advanced knowledge. This is achieved on the grounds that they are either illiterate, less educated or less equipped in certain subjects, and so are incapable of grasping and using advanced knowledge. Their performance in the present schooling system is taken as a criterion for making such discriminations. They are cornered and forced to follow and implement the packages of practices which never work in the real situations in their fields and help build added mistrust of the system, because the risks in following these practices are not insured by the society. Thus at present advanced scientific knowledge is locked up in the research laboratories in the Universities and in the libraries. It has created monopoly assets only to the graduates, academicians, research scholars and experts in the respective fields. Our present education system has thus nursed the evils of keeping our knowledge segregated, scattered, specialised, strangulated and inaccessible forever to the majority.

If, the real benefits of the coming, third and fourth wave of industrial, technological society, are to reach the last man in the community, then it is now highly necessary to create, enlarge and establish viable entrepreneurship amongst the masses.

Unless we succeed in creating an enlightened, enriched, decentralised universal base of entrepreneurship in them no political endeavour or money market efforts can bring real prosperity to all. Now new knowledge is too important to be only with the graduates, the academicians and experts in the respective fields. The present computer/telecommunication revolution is fast changing the way we can relate to one another and is altering the manner in which knowledge can be developed, disseminated and shared. The present legal authority of the universities to produce, process impart and qualify knowledge is fast going to dwindle and fade out, unless it throws open the flood gates of recent knowledge open to all, and to who-so-ever, who wants it.

Prayog Pariwar's basic approach since its inception has been to build a straight, free and viable access to advanced scientific knowledge to who so ever who wants it. Our grass roots people need genuine resource literacy and their own techniracy (technological literacy); to help them on their own to read and learn their neighbourhood problems and to deal successfully with these on their own and within the limitations of their own resources. P.P. has always been successful in creating, cultivating and propagating such universal real zest for knowledge by the process of demystification of science and deprofessionalisation of education.

DEMYSTIFICATION OF SCIENCE :

In demystification of science the best and the latest of the postgraduate level & research level knowledge is taken straight to the masses. P.P. has by now well established that just as in political, social and cultural areas of life illiteracy or less education is not a bar for begetting leadership and achieving perfection in ones own pursuits, so also for learning and assimilating high level knowledge illiteracy or backwardness in education is not a bar.

It is a wrong assumption that is nursed without testing by the present schooled system of education. P.P. is the first to demonstrate & pursue this entirely new shift for dissemination of knowledge through its process of demystification of science.

In demystification of science any one from among the masses (The educated as well as uneducated) can take for original study, its applications and testing, any of the post graduate level university text books, or any of the original research papers. In the process of demystification of science the whole content, (context, new concepts and catch words in the books and relevant papers) is explained and presented to the masses in their own idiom and languages. As also more familiar terminology is invented and used to convey the significance in the original text. To give an illustration the grape growers in Maharashtra are using their own terminologies as mother canes, daughter canes, grand daughter canes in place of primary, secondary and tertiary canes. One can see the new terms developed are conceptually and content wise more appropriate and explanatory than the original scientific terms. They have thus a large vocabulary of their own terminologies such as 'stop and go method', 'stop and turn method', 'G.A.' and 'G.D. operations', etc. Thus with demystification, new confidence, new learning and experimenting capacities, new zest for added knowledge begins to develop among them. They then on their own begin to test and propagate this knowledge amongst their friends in a deprofessionalised way. The most interesting finding is that the so called professionals - the doctors, engineers and professors - also find this approach helpful for their study in grapes, since without proper background they too are incapable of deciphering the contents of the original research papers on grapes. Our present educational system has polarised our knowledge so much that these professionals too get mystified while pursuing any original advance study in agriculture. The popularity of P.P. amongst the educated as well amongst the uneducated is because of this approach of demystification of science in any branch of modern knowledge.

“The grape revolution” in Maharashtra started some where around 1966. A big volume of about eight hundred pages on General Viticulture was then compiled by A.J.Winkler for University of California. Our newly budding grape growers group had a collection of some very difficult to get foreign books at that time). None of them except one or two were able to read English, and that too was high school level English. But the book was well illustrated with tables, photos, graphs, and diagrams. They began to compare their field results with those given in the books first through such illustrations and later through deeper understanding of the content demystified to them by P.P. Gradually they began to refer to the contents and the index and also to recognise many words such as training, pruning, ions, aminoacids, carbohydrates, berries, cane, callus etc. The popularity of this volume - a really very tough book even for the post graduates & research scholars in grapes-grew so much that I was asked to translate the entire volume in Marathi. A special permission for this translation was obtained from the University of California by paying token royalty in dollars. The first two thousand copies of the Marathi volume were published in 1984 by the Maharashtra Grape Growers Association. The myth that some knowledge is very difficult and superior to other was thus clearly exploded by this unique success of our grape growers. Some of the grape growers have now personal collections of books and original papers on grapes & related topics to the tune of fifty thousand Rs. or even more. One among them with an in-depth understanding in grape studies is respected as the Vice Chancellor (He knows very little English) of the entire growers network in our state.

INTERACTIVENESS :

P.P. has by now well established some important criteria for phasing this process of demystification of science.

The first criterion is that, there should be a clear promise of achieving the success through the process of learning. With this promise people on their own come seeking relevant knowledge and they become interactive by actively participating in the process of demystification of science. Now modern agricultural sciences highlight the possibilities of getting assured record yields not only through following certain commercial packages but through new original insight in the whole process of agricultural returns. Modern agricultural sciences promise us that by harvesting the incoming sunlight the very day, through mature green leaves at any place. (waste land, terrace, balcony, even walls) one can generate a wealth of minimum five rupees per sq.ft. in one year. That is, it comes to Rs. five thousand per guntha of land and two lakh per Acre. To get such record yields one must, through self study, learn various basic new principles in botany, plant physiology, biochemistry and molecular biology. Such assured promises duly keep the participants interactive on their own without any external allurements.

The second criterion is that, if people fail to remain interactive then it is the weakness of the process of demystification of knowledge, and one has to improve upon and supplement the other knowledge related to it, so that people, become interactive again. Thus the grape growers' problems in drought prone areas are entirely different than those in wet monsoon regions & people interact for knowledge useful for the first zone will not be necessarily interactive for the knowledge in the second zone & vice versa.

The third criterion is that this whole process of inter-activeness is a non-institutional type of activity. It has multiple entry points and participants may be located at odd distant places. It starts with the process of self-arising, self-apprising, self-appraising, self-sustaining and self-multiplying network, of self-identifying participants.

It is a network spread over at odd distant places, but knitted in such a manner that at various nodal points participants begin to strive together to solve their problems on their own and for the common good of the entire network.

Thus for example in our city farming network, the problems in the city of Bombay located in a high monsoon track will be entirely different than those in Sangli or other low monsoon zone cities. Each will ask for knowledge which one will like to invest at one's own nodal problems but by doing so he will be helping the city farming groups else where. In city farming at Bombay creating fertile soil in the neighbourhood is a unique problem. But on getting basic deeper insight in the fertile soil profile they are now creating a new type of soil from the sugar cane waste thrown away at the sugar juice bars and from the tender coconut cover trash. This method not only creates light fertile soil but also soil with good tilth and moisture retention capacity. At Sangli the retention of moisture from the morning dew is a great asset and thus the interactiveness is further knitted amongst these participants with a new sense of togetherness and sense of belonging.

THE PEER GROUPS :

No university system, open or conventional, can dream of building such networks straight through advanced knowledge investment among the masses. P.P. does all this through demystification of knowledge and that too at each participants own level of awareness and choice. This non-system, non-institutional approach of P.P. has given it added strength in reducing its operational costs and in imparting more flexibility & mobility to its nodal points in the network. As it fans out to people in various walks of life coming together to resolve their field's problems through added investment of knowledge, these nodal cells in the network become more interactive and more involved with each other's pursuits, successes and failures. They together begin to share each other's costs and losses as also they begin to create new credits & goodwill to extend and to exchange with one another.

New Peer Groups are thus formed from within the community, linking like-minded venturers to build up their own related faculty of knowledge (in grapes, city farming, wasteland development, old age health, child rearing etc.) These peer groups through their self studies and experiments, gradually emerge as interactive, involved, innovative networks to fathom and venture on their own and to resolve the problems facing them. These networks do this as if they are well established advanced faculties of knowledge. The strength of such faculties is in many instances found to be matching & at times superior, to similar faculties in the universities.

VENTURE FORMATS :

With the process of demystification of advanced science the participants begin to delineate their problems in the field. With their acquired proper knowledge, information about the scientific principles involved in solving their problems in their real life situations on their own, their latent risk taking capacities in the network become expressive and operative. The capacity of taking calculated risks in real life situations is called venture. P.P.'s venture development method through investment of knowledge thus goes on creating and adding new fulcrums of development in the community. Previous to such development of 'entrepreneurship fulcrums' no development is ever dreamt possible in such situation.

To give an illustration the small number of grape growers of Maharashtra succeeded in making grape cultivation popular all over the state, only because, they invented their own new techniques, to get full harvest, of sixteen tons of grapes, per acre in the very year of plantation. In the rest of the world the first good harvest in grapes is taken only at the end of the third year.

Unless our farmers had succeeded in reducing this waiting period to one year, under their stringent economic conditions very few from among the small farmers could have reaped the real benefits of grape cultivation.

To make mention of their other achievement, the agricultural universities by early 1965 had declared that seedless grape varieties are not suitable for Maharashtra. If the grape growers had been carried away by this guidance given by the university experts and had not professionally opted on their own to venture in seedless varieties at their own risk, the present scientific grape revolution of seedless quality grapes in the state would not have materialised. Now mostly all the old seeded varieties are replaced by many good quality seedless varieties of which some new varieties are developed by the farmers themselves through the process of selection of canes from vines in their own vineyards. I can go on adding a list of at least more than a hundred such ventures because of which the present scientific grape revolution in the state is by now a well established industry.

Thus the entire approach of P.P. in field oriented research development is 'venture development' amongst the masses through proper demystification of advanced science & network dissemination of it.

Let us now study some main features of this venture format :

1. Every venture always contains some scientific principles or knowledge or information content in it:

Thus the break through of taking full harvest the very first year of grape plantation was possible only by learning and harnessing the climatic conditions in the state from February to June end. As also, this was further made well assured, by developing new techniques for getting assured full growth, and spread and full maturity of canes as well in this short period of about five months. Techniques such as 'stop and go method', 'subcane' and 'super subcane' method are all developed by the venturers at the nodal points in the network.

2. Every venture always contains an element of calculated risk fitting to certain real life situations only :

Thus in the above illustration in real life situations farmers have very little economic cushioning unless they reduce the waiting period for the first crop to one year. Also the monsoon climate is not good for grapes. So inventing new techniques to get full spread & growth as also maturity before regular monsoon gets established was a must to get early assured crop.

3. Every venture helps to stimulate various forms of adequacies resting in the individual but not realised by him earlier :

This makes everyone to discover, others who will help in having learning exchange with him to help him in realising his goal.

Thus there is no previous learning bar. No geographical location bar, no age or sex bar or economical or social status bar, implicit or inherent in the structure of venture. It is a free trust in various latent adequacies and potentials in each and every individual in the community.

4. Every venture, when realised, has the capacity to redefine the existing form of real life situations in a new manner :

The qualitative change in one's own life situations helps to build in one, added confidence and hope, while fulfilling his needs. One thus goes on accumulating added adequacies within oneself on one's own. In other words this means one can create self-employments to one's satisfaction in one's own field of liking and living. Every new venture has an innate capacity to generate various types of new employments thorough added wealth generation.

5. As the functioning of ventures is always in the network of learning exchanges, a new fraternity, a new trust in knowledge utilisation and a method of experimentation is built up amongst the participants:

With the new trust in knowledge utilisation and experimentation a new cadre of decentralised deprofessionalised, talent interpolation emerges from within the network at various nodal points. This growth further creates an added desire to share and care for each other's experiences, aspirations and limitations. Each one becomes a new type of Gypsy in the world of Knowledge.

6. Every venture has an inherent potential to go on budding by chain reaction :

This is because in venture realisation each one is an explorer and a discoverer in one's real life situations. Thus in our experimentally involved grape growers cells various ventures in training of vines led to further ventures in the spacing of vines, and then to canopy management ventures.

These further led to ventures of root study of grapes which again led to fertile soil building ventures and subsequently to no external input ventures and to have within bower system of live plants, in place of present metal bars & wires, as also ventures in Natueco Culture in grapes, which is entirely different from the present widely professed natural farming packages or organic farming packages.

Natueco Farming is farming done by understanding nature more and more (through latest science) while in natural farming, farming is done by trusting nature and not by understanding it.

Thus the first and foremost work that P.P. is now struggling to promote, is firstly to build up ventures and then promoting entrepreneurship in the society. Our masses today need, not the government subsidies or multinational packages or charities & donations form the well to do to survive and progress, but only the genuine tool of techniracy (technological-literacy) to help them on their own to read and learn their neighbourhood problems and to deal successfully with these, through their own resources. Through investment of the best of the scientific findings about nature P.P. has seen that a new vision of Natueco Culture will change the entire face of our present development paradigm. Today bio chemistry, molecular biology, genetic engineering, plant physiology etc. incorporate many of these findings.

The changing needs and goals of the present scientific age have urged the common masses to seek on their own, their own-techniracy to cope with their problems. Prayog Pariwar's venture formats are seen to be (amply well) capable of extending to each one of them, this new sociology of science, with the right to decide, what one wants to learn, at what time in their life, with whom, how much and where.

We have seen that it is always and every where possible to initiate, originate, explore, discover, formulate, build, accumulate, propagate and release various types of ventures, to throw open the flood gates of knowledge to the masses. This new approach of field oriented venture development in the society further conceives and demonstrates that the available knowledge potential in our present community is so great that even with the investment of a fraction of this thought resource, it is possible not only to reshape the destiny of the entire world but also to channelise the latent creative forces of the under developed, developing, developed & over developed countries too.

It is not the lack of funds, but the failure to evolve a new system of learning for free and equal access to all kinds of knowledge forms to who so ever is in real need of these, that is making the knowledge education less useful to the community.

When people begin to have novel glimpses of deschooled venture education, and begin experiencing how knowledge comes knocking at their very doors (not as odd sets of extension packages or practices, but as “ventures” that are functions of their real life situations), their latent choiceless awareness flares into self awareness and then to calculated risk taking capacities (i.e. venture capacities) in the respective fields of life. Thus in a sense new entrepreneurship develops among the masses that is the real core of an industrial community. This sort of human transformation adds to the total entrepreneurship in the community to make it more operative, expressive and functional. Then no knowledge or learning is thought superior but simply treated as different.

Everyone in the community has free access to whatever knowledge one wants to learn and use and is not barred from learning, simply because one does not fulfill some conditions of the schooling system.

Our experience in the scientific grape and similar other revolutions in Maharashtra has amply shown that in such deschooled cells, each venturer is eager to share his knowledge, insights, expertise, innovations and difficulties in the field with anybody eager to share and to respond by giving the necessary feedback and wants to enter into further involvements. They thus build up a new common trust of knowledge reserve and a real fraternity of knowledge. It begins to function on its own as an alma - mater in respective faculties of knowledge. The community is thus freed from the present schooled system of education in a non-structured way and the society is free to draw upon any form of knowledge (from any branch of science and other faculties) at any moment and for any purpose.

Thus, to build up a truly prosperous industrial and highly scientific and technological society in neighbourhood of every rural set up, the first and foremost need of promoting entrepreneurship in a non-system way can be met by making all in deschooled manner.

The Gist :

Before proceeding for the conclusions let us sum up in brief the above mentioned salient features of Prayog Pariwar. These are again reproduced here from my short speech made in 1990, while receiving the prestigious Jammalal Bajaj Award for the application of science and technology for rural development.

1. Our experience proves that our rural community may be less educated or even-illiterate; but it possesses as high a level of I.Q. (Intelligence Quotient) as our eminent professionals.
2. With this I.Q. and with the process of demystification of science, even the illiterate are capable of grasping high level scientific knowledge and research data in any field of life that they feel is helpful to them.
3. After grasping the content, they are capable of using it to build up their own techniracy to achieve their most coveted practical goals. They then move forward on their own through their own experimentation and field research related to their sceptic & concrete problems.
4. Thus a new network of learning exchanges develops on its own from within different groups, spread over different places and in different walks of life. This is a new sociology of science and education, a new non system approach for achieving genuine investment of science and new thought among the masses.
5. All this rests more on deschooling society than on other aids, inputs, subsidies and provisions or promises.
6. With this self earned and testified strength of science, they develop the capacity of the individuals and the community to take calculated risk on their own strength. This is 'Venture'.
7. These numerous ventures then generate in the community an ever increasing and lasting entrepreneurship which is the real core of development.
8. It then generates new credit and goodwill in the locality as well in the network for further wealth generation and sharing.

CONCLUSIONS :

1. We must try to make open universities as much non-conventional as we can. Prayog Pariwar is deemed by many as a totally non conventional (invisible) open university. The whole approach of P.P. is thus a non-system (out of the system) approach.
2. The present university education takes its main job as producing clever graduates, academicians and experts who are paid to think, teach and serve private entrepreneurs on profit oriented lines than on development lines.

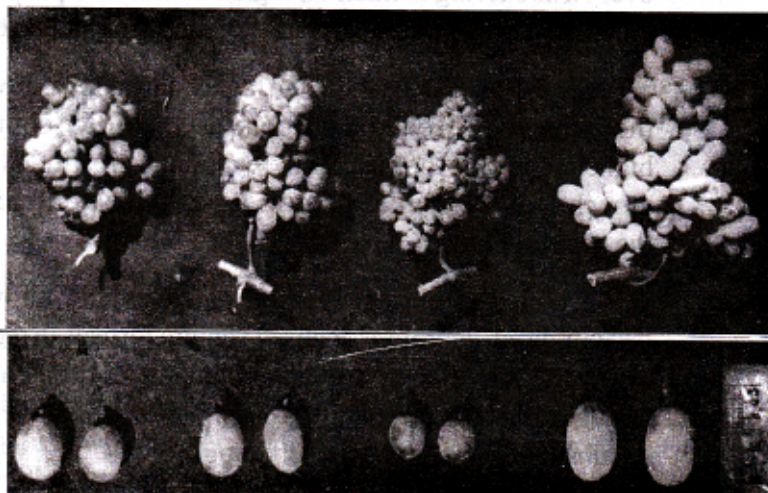
P.P. has changed talent oriented goal of education to 'Venture development' amongst the masses at large and thus creating growing entrepreneurship in the community. More over P.P. is striving to make all higher education a people oriented resource by trying to establish it as a Universal right rather than a privilege for a small minority.

3. P.P. has shown that the more the higher education is invested in the society, the more is the within growth of the development ethos in the community. Thus more the zest for higher education the faster is the economic growth. The secret of perpetual economic growth and development progress, lies in the field oriented venture development amongst the people at large.
4. P.P.'s non institutional method of advancing knowledge through demystified, decentralised, deprofessionalised venture formats in the networks, reduces the external costs. All other costs are judged collected, borne and utilised by the respective emerging faculties of venture groups. No cushioning of government grants or donations or subsidies from others is ever thought of.

To give an illustration if one will estimate the entire cost of the present scientific grape revolution in our state it will be no less than ten million Rs. But all this was met either as cash, kind, good will, credit or due insurance inputs from thousands of participants in the network. P.P. calls this an activity bank, method, where credit points are deposited, accumulated, invested and recycled as in any regular bank. Now some of these networks are having their own R & D wings too. P.P. has by now seen, that the same process is replicable in other areas of development such as marginal farmers, labourers, household women, tribals and from the city slums. These are the groups and areas where shadow work has created tremendous exploitation creating utterly inhuman conditions.

- In this system, the courses, the course books, the audio and video aids, the expert computer system etc. emerge only after the legitimacy of the relevant knowledge content in it is well established first in the network, and in terms and idioms of the participants. The present O.U. System of providing expert written books and study papers edited with some routine drab processing is avoided. P.P's emerging faculties decide the manner in which the material is to be produced, edited, published and sold. P.P. had by now found that especially in the areas of audio-video tapes and expert computer system there is much to be done and great scope to open out and experiment, on altogether new lateral thinking on new lines. P.P. is hopeful of achieving this as it is getting inbuilt within support to pursue such new experiments from the venturers them selves.

First experiment with Thompson seedless done in 1966 by Tasgaon group without formal education but by following P.P. method of research and experimentation. The success of this experiment done by the farmers themselves has built the Grape Revolution.



With girdling only	With G.A. only	Without G.A. and girdling	With G.A. and girdling
Thickness	Elongation		Thickness & Elongation

Tas-A-Ganesh
A new mutant variety spotted and developed by the same experimenting group in 1972.



- The present technological innovations in printing, typing, xeroxing, slide-making, video-audio tapes, CD-ROMs, Multi-media Computer Networks, International telephone, Fax, Internet and WWW links have opened for the masses, new vistas and frontiers of knowledge beyond the control of the present university systems.

It is high time now to reinvent and re-orient the present university role of providing only academic credits,

distant learning, certificates, grades, degrees without assuring real employment or self employment to the learners. Now the university system should device ways to invest the best of knowledge amongst the masses to increase their risk taking capacities within their neighbourhood resources through high standard resource literacy. P.P. puts this symbolically as $N.N'(R)$, where N is for neighbourhood N' is for network and (R) stands for all natural resources and institutional resources of the community. P.P. has now well established that this can be achieved through investment of appropriate advanced knowledge by networking it in the neighbourhood. When put in the above symbolic form it becomes $(K)N'N$ where K is for knowledge, N' for network and N for neighbourhood. Thus P.P. has devised this way of building neighbourhood network of resources through knowledge networking in the neighbourhood. More precisely the P.P. approach is $NN'(R) \leftrightarrow (K)N'N$ with this process we can turn the present international informatics into a truly interactive involved innovative tool for venture development amongst the masses.

GREY MATTER REVOLUTION :

The present global perspective in development is tending towards establishing market economy as the first foundation stone of all other progress. This perspective is based on two assumptions.

1. The entire economic activity would be propelled by network of entrepreneurs.
2. With the emergence of this network, more people will participate both as consumers and producers so that ultimately a new type of prosumer society will emerge bringing prosperity everywhere in the world.

The approach of Prayog Pariwar further modifies this vision by making the community at large a community of venturers and entrepreneurs. So every one, along with being a producer and consumer of goods, will be also a producer and consumer of new knowledge.

To make this comparison of P.P. approach and Market Economy approach more explicit and concrete let us discuss further the recent policies that are moving towards Market Economy. The hope is that global liberalisation will spur the economy by bringing more investment and competition. More people will participate both as consumers and producers. This deregulated economic activity will be propelled by the network of entrepreneurs and industries. But there is one important dilemma overlooked in this thinking.

In developing countries like India, more than seventy percent and in under-developed countries more than eighty five percent of the present population is unable to participate in this Market Economic System. As a result they are excluded from this vision of development from the start to the end.

The new growth dynamics $NN' (R) \longleftrightarrow (K) N'N$ established by P.P. can avert this plight. The real nature of development should be of venture participation by all. True development is possible through enrichment of neighbourhood resources through ventures generated by enlightened human grey matter. The process of demystification of science as ushered by P.P. is capable of achieving this grey matter revolution. It is not the green notes that will ultimately bring forth all sided development but the enrichment of natural resources through decentralised venture formats by harvesting the daily incoming sunlight through green cover at each one's habitat. This process can be accelerated by encouraging each one of us to become venturer, an innovator and in a sense a mini-scientist. In this age of science now the role of martyrs is to be replaced by the role of venturers to remove the evils in the neighbourhood. In our seminar in Kassel University, Germany on, "Science for rural development" it was well pointed out and brought forth that the blood of scientists is thicker than the blood of martyrs. The P.P. approach towards higher education of making each one a gypsy, a tramp in the field of knowledge, science and venture is sure to infuse this blood of scientists in the veins of the venturers.

HONOURS AND RECOGNITIONS

Recipient of 1990 Jamnalal Bajaj Award
for application of Science and Technology
for Rural Development
Shri S. A. Dabholkar

Born in 1924, Shri S.A. Dabholkar, M.Sc., is an educationist of a unique kind. His efforts are to shape education as a tool for total change in the life situation of an average worker in the rural areas.

Till 1958, he was occupied with several institutional activities of his own design. Since 1958, till voluntary retirement in 1979, he worked as lecturer in Mathematics in Mouni Vidyapeeth, Gargoti. Premature retirement was with a view to venturing into diverse fields of work on non-institutional lines. He has all along evinced special interest in i) techniques of teaching and knowledge communication, and, ii) agricultural productivity research and innovation.

He pursued his early experiments in the field of Kitchen Gardening, Home farming and Market Gardening and developed a new approach and technique in this field. Some of these results were later published in two special supplements in Kirloskar Magazine which created sensation among the readers and more than ten thousand letters poured in, expressing their desire to have experimental involvement. To channelise this budding enthusiasm various action oriented programmes were dynamically propagated.

A minimum of 10000 sq.ft. (1/4 Acre) sunlight of wasteland is enough, he contends to bring an average family of five persons substantially to average middle class level. His work during the last more than a decade has brought about a revolution in grape culture in Maharashtra State that started at Tasgaon, Sangli District, in 1966. Farmers holding hardly half an acre to one hectare and facing very adverse natural conditions have now taken to grape production all over Maharashtra (30000 Acres/15000 Growers) and earned high incomes in the international and national markets. They are now the leading Grape producers in India fetching the highest price to their production. The yearly turnover is over Rs. 300 crores creating full-time employments per acre. These Grape growers over the state honour him as 'Draksha Mavuli', 'Prayog Mavuli', etc. He has done voluminous work by way of publications on grape culture (more than thousand printed pages) in Marathi. This trend has now spread in other horticultural crops (Pomegranate, Ber, Mango, Banana, etc.)

He has now perfected his own system of "Prayog Pariwar" or "Experimental Web" and is busy building a new sociology of science and education through this Web (Cell) activity. It has some close resemblances to the recently put forth thesis of "Deschooling Society" by Ivan Illich and Paulo Freire (Pedagogy of the Oppressed).

His work in the field of non-formal and mutual network education (through demystification of science and various types of venture designs) is now gaining critical appreciation and world-wide support. Some of his work is now published in German.

He realised the need for demystification when he decided to reach the last man in the field, and to find solutions in his own life situations. His method of teaching is novel; he tries to make a farmer examine his land, what it grows, makes him observe how a plant grows etc.; the method helps the farmer to understand not only science but the ecology in which he lives and helps to seek solutions to his problem in his own environment. For example, govt. agents advocate chicken mash as a food for poultry breeds. It is expensive. Farmer is goaded into buying it. Dabholkar raises the question : What is there in the chicken mash which may be available in the neighbourhood ? He can thus improve his understanding, develop insights into his own environment and reduce his dependence on outside forces. Often he gets better substitutes at no cost. This line of thinking has resulted in reducing dependence of farmers on chemical fertilisers, pesticides, etc. Further what is equally important, is that a farmer understands the plant physiology better and how to intervene in the plant growth in order to get maximum production, in lesser time and through use of wasted resources in his environment.

Shri Dabholkar is presently busy with the thesis on Survival Agriculture (End poverty approach) through a new type of network venture neighbourhood, and demystified science. He hopes to arrive at a practical universally applicable solution. He has two publications now on this thesis in Marathi language 1. Vipulach Srushty, and 2. Kelyane Hōt Ahe Re, that are in great demand.

Shri Dabholkar is the recipient of many honours/awards. In 1979, the Marathi Vidnyan Parishad honoured him the Award of Rs. 51,000/- from the Vasantrya Naik Pratisthan, again for his agricultural research. The Doordarshan, Bombay Kendra, presented two episodes showing Shri Dabholkar's work in the field of Grape and other cultivation. Recently, he has been appointed a consultant and resource person by the Yeshwantrao Chavan Maharashtra Open University for its study courses for the farmers.

Brief speech made after receiving the Jamnalal Bajaj Award 1990

Honorable Prof. Dr. Herbert Schambeck, the Chief Guest of the evening, distinguished personalities on the dais and friends, I propose to make the most of the brief time available to me.

At the outset I must express my happiness at receiving this prestigious award associated with the name of Jamnalalji. Jamnalalji himself received the highest honour that this world can ever offer. He was adopted in an intimate sense by Mahatma Gandhi as his fifth son. What greater honour than this can humanity ever think of?

I must here also place on record how gratefully I remember on this occasion Shri J. P. Naik, the world renowned eminent educationalist, and Shri. Annasaheb Sahasrabuddhe, the veteran Gandhian leader and constructive worker, both of revered memory, who were among the first (nearly thirty years ago) to appreciate my present approach to rural development and total change.



Shri Annasaheb Sahasrabuddhe
1897-1980



Annasaheb and group at the
Gopuri Ashram farm.

This new approach to rural development since the very beginning has emerged through educational and other original research carried out on the basis of self-arising, self-appraising, self-sustaining and self-multiplying network of self-identifying participants. This whole activity gradually got crystallized some twenty years ago in what we since then have termed *Prayog - Pariwar*.

The word *Prayog* signifies 'experiments' and the word *Pariwar* signifies sense of belonging and togetherness till the success in the experiment is achieved. This is a new type of fraternity where no one rules and every one in the group fully participates to realise the common goal. Moreover, this is not any institutional type of activity but a new type of network, spread over at odd distant places knitted and striving together to solve their problems for the common good.

It is a common pursuit for acquiring, assimilating and utilising the latest of the post graduate and research level scientific knowledge and modern thought to resolve their problems in the field. For this, the process of *Prayog Pariwar* is the process of demystification of science and deprofessionalisation of education. This new approach through some happy events has also by now acquired worldwide acclamation and recognition.

Ivan Illich the pioneer of the explosive thought 'Deschooling Society' found very close resemblance in his thesis of education and that of *Prayog Pariwar*. At his invitation the thesis of *Prayog Pariwar* was first critically presented by me in 1974 in the International Seminar at Curnavaca, Mexico on 'Pitfalls of Deschooling Society'. In 1979 in Kassel University, West Germany, there was a three - day seminar where I was invited to spell out first our approach and then lead the discussion along with Paulo Freire, another eminent world famous thinker and activist in the field of education. His work on the 'Pedagogy of the Oppressed' and *Prayog Pariwar's* approach of demystification of science, deprofessionalisation of education and venture generation among the masses were on the anvil of the dialogue for critical scrutiny and understanding.

This *Prayog Pariwar* approach has already fetched high results in the state of Maharashtra. The present grape and other horticultural revolution in draught prone areas of the state is deeply rooted in this process of self-study and experimentation and has now a yearly turnover of 400 crores of rupees. Small and marginal farmers (1/2 acre to 2 acres) from these areas are now getting assured record yields - as assured as in well-established industries. At one time a bank credit of Rs.500/- per acre was not available to them. Now banks are prepared to advance to them Rs. 50,000/- per acre on long term basis. They are now on their own getting further organised for foreign export and for various processing industries.

They have achieved all this through self-studies and ventures in the field. For this they spared no efforts to acquire and use the latest research and post-graduate level knowledge.

With their original experiments they translated all this to succeed within the limitations of their real life situation. There was no dependence on government or agricultural universities. The way they have all together emerged as a powerful fullfledged wealth generating cell in the state, is an exciting story. But our time is limited and I must sum up.

So what are the salient features of *Prayog Pariwar* ?

1. Our experience proves that our rural community may be less educated or even illiterate; but it possesses a high level I.Q. (Intelligence Quotient) as our eminent professionals.
2. With this I.Q. and with the process of demystification of science even the illiterate are capable of grasping high level scientific knowledge and research data in any field of life that they feel is helpful to them.
3. After grasping the content they are capable of using it to build up their own techniracy to achieve their most coveted practical goals. They then move forward on their own through their own experimentation and field research related to their concrete problems.
4. Thus a new network of learning exchanges develops on its own from within different groups spread over at different places and in different walks of life. It is a new sociology of science and education- a new non-system approach for achieving genuine investment of science and new thought among the masses.
5. All this rests more on deschooling society than on other aids, inputs, subsidies and provisions or promises.
6. With this self earned and testified strength of science they develop the capacity of the individuals and the community to take calculated risk on their own strength. This is 'venture'.
7. These of so many ventures, then generate in the community ever increasing and lasting entrepreneurship which is the real core of development.
8. It then generates new credit and goodwill in the locality as well in the network for further wealth generation and sharing.

More can be said but I am aware the time is up. As this may be the first time you may be coming across this non-system new thesis on development you would naturally have some questions and doubts. In that case I can only invite you to join the venture from where you are and as you are and find out for yourself it is applicable to all cases (and not only to agriculture) and anywhere else wherever we have a problem and are seeking solutions.

So welcome one and all to join this caravan.

And finally thanks to you All - each and every one of you.

NEWS AND VIEWS

Free Press Journal, Bombay

Date : 5-6-95

Follow nature's path to alleviate poverty, says expert

Bombay : Linking natural resource development with that of human resource was essential for creating a new national wealth in terms of energy according to Prof. Shripad A. Dabholkar, the director of 'Prayog Pariwar Methodology', the school of nature, reports PTI.

Speaking at a day long preparatory meeting on the United Nations theme of the year, 'Poverty Alleviation' at Gandhi Smarak Nidhi 'Manibhavan', here on Saturday, Prof. Dabholkar said that this linking could really make even the last man in the country an entrepreneur.

" This entrepreneur can enrich the natural resources quantitatively and qualitatively with sunlight, soil and water with little enlightenment. The networking of knowledge will empower him and thus it can create a trusteeship which will be measured in terms of energy."

According to him this type of creating entrepreneurship would create an 'Activity Bank' which would go a long way in creating a novel way of equity, market sharing and thus the shareholdership of energy in the villages.

Prof. Dabholkar further explained his experiments which have helped resourceless grape cultivators of Maharashtra to become resourceful.

He said one could utilise 10 'guntha' land (about one tenth of an acre) for a sustained middle-class life-style of a family and could network all the experiments which were nature-friendly and man-friendly.

Scientific Crusader of the Countryside

Affectionately called *Draksha Mauli* by grateful farmers, he was recently conferred the 1990 Jamnalal Bajaj award "for using science and technology for rural development." Anand Agashe profiles Shripad Achyut Dabholkar.

It is difficult to place the man. Through endowed with a razor sharp intellect, he does not behave like an intellectual. Although not a professional farmer, he has farming experts eating out of his hand. He scoffs at academics but is the pioneer of a novel method of learning for a vast populace in rural India. By no means is he a leader in the usual sense, yet he has an enviably large following in various circles. An enigma? Yes. And much more.

When Shripad A. Dabholkar was conferred with the 1990 Jamnalal Bajaj award on November 2 in Bombay, the citation said he was being honoured for his crusade of applying science and technology to rural development.

That, though, is only one aspect of the Dabholkar story, as one learns with a visit to his double-storeyed house on the outskirts of Kolhapur city.

However, one has to be lucky to find him home, for he tours for an average of twentyfive days a month. When at home, Dabholkar is invariably engrossed in either a stack of

papers or listening to a visiting group of farmers. Or else, he is talking to the plants, shrubs and trees that crowd his courtyard and terrace.

His silver-grey hair is the only sign of advanced age; otherwise, this lithe-framed, fast-talking man, a veritable storehouse of energy, sweeps you off with his unorthodox methods and originality of thought.

For instance, he was responsible for Maharashtra's 'Grape Revolution' of a few years ago. Thanks to him, grape-cultivation is no longer monopolised by rich farmers owning vast stretches of fertile land with abundant water supply. Dabholkar's novel approach to grape cultivation, which was replicate with certain appropriate modifications elsewhere, enabled even small and marginal farmers owning merely a half to one hectare of land in severe drought-prone areas in the state now reap from 12 to 16 tons of high quality grapes per acre. The daily water requirement for that kind of yield is a mere 6,000 to

10,000 liters per acre.

As more farmers have taken to grape cultivation by Dabholkar's novel method in recent years, the state's annual grapes turnover has reached Rs.400 crore. Grape cultivators are now coming together in groups to export the fruit. A few wineries too are on the anvil. Small wonder, then, that grape cultivators in the countryside fondly call him **Draksha Mauli**.

Dabholkar, however, prefers his other nickname *Prayog Mauli*. For, it is his constant experimentation that has helped him accomplish all that he has so far. More importantly, he is convinced that it is this approach that can offer the panacea to all problems.

A refreshing philosophical approach to social problems underlies Dabholkar's methods. Simply put, Dabholkar believes there are three schools of activists: those who use the existing systems, those who wish to improve the existing system, and those who insist on changing the existing system.

He belongs to none of these. "Just withdraw yourself from the system and go about your task," he says.

It was in his small kitchen garden that his philosophy and methods took shape. "I never ever accepted as gospel truth the teachings in text books and the sermons of highly-placed individuals unless I ascertained the veracity of what they taught." Placed as he was in a rural set-up, Dabholkar's attention naturally went first to the problems faced by farmers. Small land holdings, scanty rainfall, the lack of irrigation facilities, and absence of financial back-up were the most prominent obstacles. Dabholkar experimented on the plants in his kitchen garden and came up with stunning results. He found that parameters of water, the quality and quantity of land, light, and other inputs could easily be circumvented with a little clever manipulation of the environment to suit plant growth. In barely 1,000 square feet in his backyard, he grew grapes, lemons, bananas, pineapples, mangoes and guavas. Keeping that produce company were a few hens and heads of cattle, which, too, were reared in total defiance of established norms.

When word spread of Dabholkar's successful green revolution, he was soon flooded with visitors and queries. Within a few years, Dabholkar had a list of over ten thousand

persons who were later to become members of his *prayog pariwar*. Dabholkar realised the significance of '*Pariwar*', and its sense of "belonging together."

Hence, although Dabholkar cannot escape being the pivotal factor in the complex process, he makes sure he does not become indispensable. All members of the *prayog pariwar* – students, farmers, housewives, and professionals – constantly communicate with one another, sharing their problems and seeking and offering solutions.

The '*grape revolution*' is now a thing of the past. The *prayog pariwar* is now experimenting with other horticultural crops like pomegranates, ber, mangoes, oranges and so on.

When Dabholkar is not on tour or busy with classes for his anxious visiting farmers, he experiments with flora and fauna on his terrace. One finds full grown, fruit-laden trees in tin pots on his 2000 square feet terrace. And the soil around the terrace. And the soil around roots is barely a few inches thick. He uses domestic garbage as fertilisers. "Even human hair, urine and such other things can be used for plant nourishment" Dabholkar says.

"Our society is energy illiterate," Dabholkar explains as he reveals the keys to his successful experiments. "Although the law of

thermodynamics states that the quantum of energy in the universe remains unaltered, we can reap tremendous benefits by recycling the various forms of energy through appropriate technology. If the sun is the starting point in the ecology, the grey cells in human brain may be considered the end point. So why not put solar energy to the best use by suitably correlating the two?"

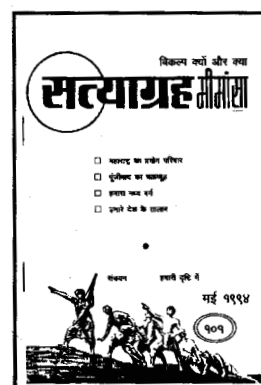
True to his background in mathematics, Dabholkar explains to farmers how they can measure the surface area of plant leaves, how solar energy can be utilised for flowers and fruit and how the overall growth of plants can be controlled to an optimum by manipulating the size and shape of plant leaves and suitably modifying the canopy. "One need not make too much of irrigation water," he claims.

Dabholkar firmly believes that illiterate and semiliterate farmers have as high an IQ as any college or university professors. All they need is "demystification" of science. Thus, if scientific knowledge and thinking are extended to farmers, and if they are prompted to apply these to their problems, they can easily come up with appropriate solutions, he argues. That is what *Prayog Pariwar* is all about. "More than the green or the white revolution, it is the revolution of the grey cells that has all the solutions," says Dabholkar. How true.

Translation of an article on Prayog Pariwar in Hindi from Satyagrah Mimansa by Shri Thakurdas Bang, President, Sarva Seva Sangh, Jaipur, in May 1994.

Prayog Pariwar of Maharashtra

Since the last two decades, Prof. S.A. Dabholkar, from Kolhapur (Maharashtra), has been conducting varied experiments in the field of agriculture. These experiments are not conducted in the laboratories, but in the actual field conditions on regular production. Prof. Dabholkar does not conduct these experiments by himself, but he motivates farmers, labourers and urban dwellers to do so.



He explains to them the experimental methods, provides scientific knowledge inputs, assesses their observations and guides them in discovering for themselves. These people experiment by themselves, being responsible for their success or failures, learn from their mistakes and make improvisations. These groups are called Prayog Pariwar.

Prof. Dabholkar graduated in Mathematics. He taught this subject for many years at the Mouni Vidyapeeth, Gargoti (Maharashtra). While teaching he developed an interest in agriculture as a hobby. Subsequently he gave up his job and started experiments in agriculture. His hobby has now transformed into his life mission. His Prayog Pariwar is growing constantly. Prayog Pariwar is not a structured body, but an informal fraternity and network of experimenting people. The success of this Pariwar and Dabholkar's experiments is not restricted to Maharashtra, but now it is widely acclaimed in many countries like Germany, USA etc. He has visited several countries to communicate his experimental methodology. For his unique work, he was awarded the Jamanalal Bajaj award. He has several publications on this subject in Marathi and English to his credit. Sarva Seva Sangh is considering publication of his material in Hindi.

To personally see the work of Prayog Pariwar, Shri Siddharaj Daddha, Shi Amarnathbhai, Shri Shivshankar Pente and Shri Thakurdas Bang accompanied Prof. Dabholkar to nine sites in Kolhapur, Sangli and Solapur districts, during 2nd to 5th April, 94. So far the major experiments of Prayog Pariwar are on grapes and sugarcane, but in some places we got to see experiments on fruit trees, vegetables and rice plantation. Our findings from this four day tour are as follows :

1. Prayog Pariwar's emphasis is on Science or latest Knowledge. Prof. Dabholkar only explains some basic established principles and leaves the details of conducting the experiment to the people themselves. The experimenters keep sending their observations, reports and problems to him and he responds to them by writing back and meeting them.

He distinguishes his method as different from the Natural Farming of the famous Japanese experimenting farmer Fukuoka. Dabholkar says that instead of just putting faith in Nature and believing that it will do everything, we must understand Nature and experiment along its principles, making full use of scientific knowledge.

2. The root source of all produce is basically solar energy. Today 99% of this energy goes waste. Hence the main goal of the experiments is to harvest this solar energy to the maximum, in form of light, through the green leaves of plants, using the available CO₂ by photosynthesis, to obtain maximum yields. With this approach they have been able to grow Rs.50,000 worth of grapes in a small patch of one fourth of an acre, with no external fertilizer inputs, which is much more than normal yields. Prof. Dabholkar says that every experimenting person can achieve a higher middle class standard of living akin to a Professor, through this knowledge.

This can be achieved even with just four hours of inputs instead of usual eight hours. Of course, these four hours have to be devoted to raising the crops.

3. It is not necessary to have a fertile soil to achieve success. The experiments can be done on any type of land. We visited Mr. Arun Mane at Atpadi, where the land was extremely rocky and barren. There was no trace of cultivable soil. In spite of this he has been able to create new fertile soil by bringing waste bio-mass from outside and by rotting the leaves shed by the standing vegetation. Weeds are allowed to grow along with other plants which are cultivated to create fertilizer by mulching.

Even insects and pests are allowed to do their work. The experiment has proved that you do not need only fertile soil for good crops.

4. Same is the case with water. This area gets very little rainfall, barely 10 to 12 inches, hence there is acute shortage of water. But by stopping the rainwater and harvesting every drop of it, records crops have been produced. Drip irrigation has been used to feed the plants. To retain humus in the soil, leaves and droppings of plants are used as mulch to cover a diameter of a foot and half. The lower level leaves rot and create soil while retaining moisture. They create a favourable microclimate like a greenhouse and offer protection from heat.
5. We saw that by creating such microclimate, any crop is being grown in any season. We found grapes and tomatoes although it was not their season. Thus the farmers need not despair if they lose a crop in its season. By harvesting the sun, using the same grapevines, a second crop was being taken.
6. We found an almost total absence of chemical fertilizers or pesticides in these experiments. Natural fertilizers were prepared and fed on the spot. Pests were regulated through biological control.
7. Everything is done with mathematic precision. Calculations of amount of sunlight harvested, number of leaves grown on plants, ideal numbers required, where to prune after the growth of five leaves and so on are the common vocabulary of the experimenting groups.

8. Small and large farmers, labourers, rural and urban folk, and women, all are members of Prayog Pariwar. Among them some are graduates. While rural members experiment in their fields, urban members experiments in pots on their terraces. In case of problems and failures to achieve the expected results, they correspond with each other or with Prof. Dabholkar. He never answers all their questions at once. It is not desirable and not encouraged, since it creates dependence. One learns thoroughly, only by doing it on one's own. This is the basis of his approach. In this manner many people can get involved and it helps to build their confidence.
9. In this type of farming, since there are no external material inputs except efforts, it does not cost anything. Thus the poorest of the poor can adopt this method. It has a broad utility value benefiting all.
10. Shri Dabholkar explains this knowledge in simple Marathi, without using difficult technical jargon. He calls this de-mystification of science. Prayog Pariwar is playing a valuable role in making agricultural science easy and accessible to all. Science is no longer the forte of scientists alone but it is now the language even of the farmers.

Shri Dabholkar explains this science through metaphors from day to day life and examples. For example he calls old leaves as mother and new sprouting leaves as daughters. In this manner, a new language of agricultural science is emerging.
11. But it is not sufficient to just acquire knowledge. Using this knowledge, the farmer must experiment himself. In this process there will be mistakes. Searching for the reasons for mistakes and inadequacies, he will have to improvise the approach. In these experiments, both the mental and physical faculties get developed. Each one has to experiment on his own and take the risk. The habit of acquiring ready stock answers has to be abandoned. This process develops entrepreneurship and risk taking capacity.
12. These experiments succeed on the basis of one's own efforts and not on the grants, subsidies or donations of the government or capitalists. Donations bring dependence and servitude. One's own efforts create confidence. This is Prayog Pariwar's conviction.

Prof. Dabholkar's interest extends beyond agriculture and mathematics to several other areas of deep concern like philosophy and spirituality. He is an extraordinary talented individual, in short a prodigy. Today his knowledge is being used according to market economics to increase wealth through cultivation of grapes and sugarcane.

But it is not difficult to utilize this knowledge to generate food and other resources to fulfill the needs of our villages, by planning and operationalizing this approach. Utilizing this knowledge, the concept of Gram-Swarajya or Autonomous Towns and Villages is possible making each individual or societies independent, self-reliant and prosperous. It can become the model for emulation in the whole of India, as the right step in eradicating poverty.

COMPARATIVE EVALUATION of Existing Establishment and the New Knowledge Networks.

A. Nature of Infrastructure	
1. Village is the key development unit. All work develops around this unit.	1. All work develops around the 'Cell' as the key unit.
2. The same infrastructure has to be repeated at the levels of village, block, taluka and districts.	2. In this concept a single 'cell' is adequate for the development needs and economic activity of entire country reducing the repetitive infrastructure expenditure.
3. This mode of operation is planned on geographic limits.	3. This approach has no geographic barriers. It is based on sharing similar work experiences, similar work areas and similar self help approaches.
4. This scheme has heavy overhead expenditure of management and operative costs. It needs an infrastructure of salaried staff.	4. This approach operates entirely on feedback and internal resources. There are no direct cash expenses. The scheme is managed by de-centralised activity banks and are spontaneous. There is no salary system yet - there is full accountability. There are barely any expenses.
5. This is organised artificially on Government, Non-Government, Educational, Political levels. (Like adoption of Villages, Service Societies, Panchayat Raj, University, Development Agency etc.	5. This is spontaneous response which amplifies people's basic economic aspirations evoking cooperation and sharing through the process of ventures, self help, beaming, priming, feedback, cell and activity bank. The various work units are self-organised.
6. It works on management approaches of medieval times.	6. The approach is based on latest group dynamics and team building management.

B. Nature of Work Programmes.	
7. Unnatural Development Goals & targets are blindly enforced by top down approach.	7. Each individuals aspirations and creative capacities are evoked and nurtured to manifest as ventures which generate resources and maintain growth.
8. These programmes are based on capitalist thinking and power structures. It creates power concentrations in few centres and results in suppression of individual expression and creativity.	8. These are totally decentralised programmes. There is not even remote possibility of enforcing any programme. Thus there is no politics involved. Regional economic development programmes.
9. These are stereotyped development programmes lacking depth experiences or imagination. They are promoted using wasteful expenditures like subsidies, incentives, loans etc. They are very rigid in their approach.	9. These programmes are rooted in each self-supporting groups. Objectives are guided by critical scientific analysis. They are very flexible in nature and get implemented without any promotion.
10. This system is responsible for the loss of credibility of scientific programmes in the people's minds.	10. This system evolves through nurturing peoples scientific approach & experimenting attitude.
11. It has limited capability of implementing a few programmes.	11. There is no limit to the number of ventures which can grow in any area of application. Thus thousands of ventures grow by chain reaction and get implemented.
12. These programmes do not survive in the competitive market.	12. These programmes can survive the competitive factors since the consumer himself is in some measure the producer. By reducing the input costs the programme becomes more viable.

C. Nature of Workers	
13. The programme is implemented through salaried staff like Dev. Officer, Gramsevaks, Primary teachers etc.	13. In this method there is a network of interested experimenting people, experts and the users who are constantly in touch.
14. There is a superficial exchange between the salaried staff and the people. (Distribution of subsidies, loan disbursement etc.,)	14. In this a gradual affinity develops between experts, experiments & the needy which transforms into stronger ties.
15. This is a top down approach. It is always dependent on external aid and guidance.	15. This develops through close cooperation between actual workers and thus gains popularity. It is a true grass-root movement. The emphasis is on internal co-operation and experience.
16. There is a need for setting up workers training programmes.	16. Training takes place naturally through ventures. There is no need for separate facility.
17. There is superficial formal discussion in youth groups, womens groups, childrens, etc.,	17. This method brings all diverse groups together like young, old, men, women, rural, urban.
18. The workers cannot give any assurances nor explanations regarding the success or failures of the programme.	18. The workers have come together on the basis of mutual trust & they are constantly analysing and contemplating all the aspects of the programme, which brings them closer.
19. Although scientific, it is blind following of foreign and alien concepts without understanding.	19. This is entirely based on a scientific work method.
20. There is no education value.	20. It has high educational value since it increases work experiences. This is important with reference to Kothari commission report.
21. It leads to loss of faith in integrated economic development.	21. It increases faith in integrated development.

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ECO - FEMINISM

'The New Thrust-Venture Formats'

Abstract :

Without investing cash inputs or taking subsidies nature has created our ever evolving, enchanting superb complex web of ecosystem. Latest science has now acquainted us with these nature's paths. By treading these paths one can earn plenty and prosperity (even more than higher middle class level of life and living) at one's door steps. This paper deals with various aspects of these new approaches.

We shall also see, how 'Eco-Feminist' movements, by following these paths, can play leading roles in accelerating the process, to establish, a gender-bias-free society. With real equity, liberty and prosperity, unto the last individual. Simultaneously, we will see how with the establishment of these approaches, there is bound to be a restructuring of the present multinational industrial nature of the society into a decentralised network of more viable, powerful, prosperous, well-poised, purposeful, eco-friendly, humane, industrial society.

1. Introduction

- 1.1 We generally believe, and profess, that our rural poverty is due to resource (material and energy) crunch in our rural neighbourhood. If we see, how nature has built this unique ecosystem, in more stringent conditions than in which our rural people live, we shall learn the first lesson of development from nature. In nature, the sum total of mass and energy always remains the same. But nature has overcome this constraint, by recycling the same materials, again and again, in its entire maze of ecosystem. The second obstacle in weaving this complex, is that of entropy. Entropy is the tendency to create more and more disorder, while in establishing the ecology, nature builds more and more complex order by pumping out entropy from the neighbourhood environment, by overcoming this tendency to go to more and more disorder.
- 1.2 To follow nature's paths, one must learn to read these and other sign posts on nature's paths. Modern progress in science, especially in biochemistry, molecular biology, bio mechanics, bio technologies, genetics and genetic engineering, electronics etc. in the last twenty years, now enables us to read most of these signposts on nature's paths. Our destination of creating an era of plenty for all can now be reached by getting accustomed to these sign posts.

2. Readings on the sign posts

The following are some of most important readings on sign posts on Nature's paths:

- 2.1 Nature builds up and maintains its entire ecosystem through its food chain.
- 2.2 In building the food chain in the first instance, light energy from the sun is converted into chemical energy by the green leaves of the plant kingdom.
- 2.3 In nature, any conversion of energy from one form to another is in energy equivalent terms. So the transactions of energy are never subsidised making one cheaper than the other. (Note-In our economic system the most clean form of energy is electricity. It is highly subsidised in energy equivalent terms.)
- 2.4 In our ecosystem, as well as in nature, energy is never exchanged for any thing except one form of energy or other. (Sooner or later our economic system will have to shift to this method in an energy use. We will discuss this later in this paper)
- 2.5 The most interesting thing in nature is that there is no unilateral consumption. While consuming food new material is built (In plants, proteins, fat parts of plants organic etc. (In animals ,flesh, blood, milk, fat, wool, bones, feathers, body wastes). The process of metabolism in living system is both the process of (1) producing and building & (2) consuming and breaking . The literal meaning of the word metabolism is exchange. (In our economic thinking too now we are envisaging the new type of producer - consumer society of the type mentioned here. The new term for it is prosumer society) In nature there is always and every where prosumer form of living.
- 2.6 Nature has increased the complexity of the ecosystem by making it multi-tier and symbiotic. In this system each one derives maximum benefit of climate, microclimate need of full light, need of partial shade, different anchoring powers of roots, different cycles of growth and dormancy, different requirement of moisture and water etc.
- 2.7 Large amount of energy is invested in bringing water to the land's biosphere from oceans through rains as also large amount of nutrients is taken to the oceans to support marine eco-system. This energy expended in running this hydraulic cycle is encashed back in still larger amount through the processes of photosynthesis carried by the plants to build the food chain. Our eco-system thrives on these 'energy gain' ratios.
- 2.8 In India the daily solar insolation per sq.ft. area is about three units of electrical energy. The green canopy of the plants can harvest about 2% to 3% of this energy. (Depending on type of plants C³ or C⁴ group) When measured in terms of increase in dry weight of the plant, it is 2 to 3 gms. per sq.ft.area per day. (This implies that a family of five can earn its daily requirements of rich food from 100 M² of area (one Guntha area) by harvesting the daily incoming sunlight falling on that area)

To sum up, in nature's scheme of running its eco-system every input and output of new growth and development is geared to energy harvesting from the sun & conserving it, investing it, upgrading it and exchanging it for more and more complex weaving of its organic system. In this process there is recycling of the same materials again and again for billions of years. Our human species is nature's latest addition to this system. We are the most complex of living organisms. We have unique capacities of knowing, understanding, conceptualising and learning various types of tool making and tool using capacities which none else in the entire remaining eco system has.

3. The new approaches

- 3.1 With this new insight in nature's inherent capacities to create plenty and prosperity with no outside cash input, one can strive to imitate and establish these for creating wealth and abundance in the neighbourhood. Prayog Pariwar (P.P.) has, (after more than forty years of experimentation), by now well laid down how to realise this nature's bounty in one's immediate neighbourhood. It is a new type of resource literacy (see the accompanying brochure page 1 & 3). The real input in development is the best of the latest knowledge taken to the last individual through the process of demystification of science and deprofessionalisation of education. P.P. has shown that with the new sociology of science and education this is universally possible (see brochure page 7 & 8).
- 3.2 The major content in this resource literacy is the critical knowledge of the process of photosynthesis, of carbon and nitrogen cycles, of mineral cycle, effects of hydraulic cycle, climatic cycle, diurnal and seasonal cycle, photo-periodism, thermo-sensitivity, the different growth and development cycles in life processes and the nature's process of building fertile soil profile through the process of greening, composting, ashing and so forth, and how we can accelerate these to create fertile soil at any place in a very short span of time. Various other details relating to index number of leaves, canopy management, training of plants, multi-tier plantation etc. can also be imparted to the common masses.
- 3.3 Interestingly enough the poverty stricken weaker sections of the society, the small and marginal farmers, the field labourers, the tribals and especially the rural women force, (in household and field work) who are presently deprived of their ecological and basic economic rights in the neighbourhood, are the first to be benefited. This is so, because they are yet more near to nature and so can read and communicate with their neighbourhood of natural resources better than our so called educated elites.

- 3.4 Prayog Pariwar has shown that the above type of resource literacy creates risk taking capacities in the masses and they become venturers. With this process they then become innovators, entrepreneurs and mini-scientists. They then succeed in creating wealth in areas of their needs and likings. In one recent paper on "Homestead Wealth for All" presented in the Indira Gandhi Memorial Conference, Prayog Pariwar has given a full outline of this approach and in the chapter 'Home Farming' in the book 'Plenty for all'. Other details of these approaches are critically established.
- 3.5 Various success stories and case studies of this venture approach are now available. Prayog Pariwar is at present working with different groups & individuals, rural sectors, women sectors, as well as tribal and student sectors. In the urban sector one can see how even on one to ten sq.ft. of area with sunlight falling on terrace or walls, one can generate variety of assured record yields in cucumber, water melons, sweet potatoes, elephant foot, sweet corn etc. in hundred days on waste water (of even our mouth wash) by building new fertile soil from the neighbourhood resources. Similar is the case with rural women who are labourers but have learnt the various details to fetch record yields in various crops through new type of resource literacy and venture developments. The scientific grape revolution in Maharashtra is another living example of the success of this approach. With these and similar other results Prayog Pariwar is now putting the thesis of minimum resource right to a family of five, it is 200M² (Two Gunthas) of Sun light for good subsistence living and 1000M² (Ten Gunthas) of Sun light for higher middle class standard of living with a daily family waste water supply of about 100 liters per 100 M² (Guntha) of area. This implies that for a village of 100 families about twenty five acre of resource right (of waste land) with concurrent supply of assured water supply will generate higher middle class standard of living for each one in the villages. Women section of the rural population will be the first to appreciate and encash the benefits of this process of neighbourhood resource enrichment and enhancement.
- 3.6 Resource enrichment implies that the quality of resource is improved many fold while resource enhancement implies that the support value of the neighbourhood resources is increased many fold. In nature's ecosystem the reproduction or replication rate is in multiples. So though initially the experiment may start and succeed on one plot, it will generate four or five times the resources, to develop four or five more plots in the period of two to three years. The enlightenment and empowerment of human grey matter, through latest of demystified science in this age of informatics is an achievable goal, with minimum of external cash inputs.

4. Neighbourhood Energy Pool

- 4.1 In nature's building of ecosystem the energy pool is built up by food chain. As human being is a tool using animal we must be able to build up our neighbourhood energy pool to enhance the primary productivity of the neighbourhood resource multifold. Then as in urban sector, women in the rural sectors too will also become decision makers, where terms of trade will be not money or profits but energy exchanges. Thus, the present technologies in the domestic spheres, that are at present available to urban woman only, will become available to all. This will free the entire women sector from the daily rut of house hold work. Nobody in the rural sector will be only a wage earner but will be an entrepreneur in one's area of needs and likings. By optimising energy and raw material and input generation in the neighbourhood through renewable sources, a new standard of living (of the present higher middle class society) will become possible.
- 4.2 To assist this genuine approach of energy exchange, P.P. and its associate groups are now making popular the concept that the energy expended in bringing water as an external input should be returned to the local water society in terms of biofuel in one form or other. We have estimated that per unit of energy consumed in bringing water will be returned as One Kg of biofuel raised in neighbourhood. Let us study in brief how by harvesting sunlight on only fifteen acres of land through any type of bagasse will provide 100 KW of energy to each village of 100 families with daily 15 units of clean electrical energy. We will then be in the real sense treading nature's paths to serve our industrial growth needs.
- 4.3 Many sugar factories are now taking to electricity generation through their bagasse accumulations. But bagasse generation is not the monopoly of sugar factories only.

As per statistics, six tons of bagasse can generate one KW electricity. To produce 100 KW electrical energy for a village, we will need 600 tons of bagasse or similar energy giving biofuel (bamboo, maize, stalks). With assured record sugarcane or similar biofuel yields (as in the present scientific grape revolution) our rural people can learn to produce and provide 600 tons of bagasse from 15 acres of land per year. Thus by harvesting the sun efficiently only fifteen acre of land will generate 100 KW energy per village. (That is One KW energy per family in an year, which is about 6000 units of electricity in a year or 15 units per day).

In this way by coming together, only hundred villages in any block can harvest and create their assured supply of ten mega watt of electricity (one megawatt = 1000 kw). by simply assigning 15 acres of land per village for energy harvesting, conserving, upgrading (as clean electrical energy with sufficient voltage) and investing and using for leading a truly flourishing industrial life in their immediate neighbourhood.

- 4.4 This energy generation will be more eco-friendly as the ash produced in burning bagasse will be the best fertiliser when recycled for the next sugarcane plantation or crops. The heat generated in the process can be made use of in raw sugar production and for other local processing industries. Availability of power will also ensure pumping of water & its delivery system which is the real need of the hour. Most of money costs will be in one way or other, the real income of the neighbourhood society (Prices of sugarcane, bagasse etc.), (use of ash fertiliser for next crops, facilities for water lifting and distribution system) (heat utilisation for various local processing industries) (least or no pollution at all). It will be in a sense, a symbiotic energy grid system.
- 4.5 The cash investment will be also about two million Rs. per village on long term basis. With the generation of electricity - the credit potential of the villages will be as great as any urban entrepreneur in small scale industries. Grape growers (small & marginal farmers) in the state of Maharashtra have already established their potential in getting crores of Rs. loan from banks for building cold storage and for other processing industries.

5. The new Industrial society is in the offing :

- 5.1 PP's new approach of enrichment and enhancement of neighbourhood resources through enlightened and empowered human grey matter through venture generation amongst the masses is now gaining critical appreciation, voluntary support and world wide acclamation. This new neighbourhood resource development thrust in development through latest input of knowledge and science in a diversified way is going to bring women's activities in the rural sector to the centre. This thrust is further going to provide incentives for demand having access and minimum clear resource right to harvest sunlight and corresponding support of water resource.

This will gradually create new situations of gender bias free family life as also social life. The new energy pool is going to relieve the daily burden of fuel and other household work. They will get the same amenities & freedom that the women in urban sector have in their domestic core of work. This is going to usher an era of gender bias free equity, liberty and prosperity for all.

- 5.2 The most natural consequence of this evolving liberating force will be that it will begin to restructure the present mode of multinational industrial way of life . When the common man will begin to have a say in one's own creation of wealth and prosperity a new mode of highly sophisticated decentralised industrial life will begin to flourish. The real strength of any industry is its scientific know how and monopoly on raw material and energy resources. But this new process of dissemination of science in venture formats amongst the masses, will build up a new sociology of science and education. The present polarisation of knowledge will fade away and the latest innovative creative forces in the masses will take the leading part to mould the destiny of the coming generation where abundance, wealth, prosperity, equity liberty for all will be the established goal.

NON-INSTITUTIONAL EXCHANGES OF PRAYOG PARIWAR

Prayog Pariwar's method of network exchanges between the various experimenting groups has evolved very successfully over the past 30 years. In the process it has evolved an alternative model of non-institutional, context based open learning. Various groups of diverse economic, social, cultural and educational backgrounds have been experimenting and exchanging their experiences and learning, and thereby enriching and building their internal resources without any type of formal institutional structure or format.

Some of the unique features of this type of learning process are :

1. It has no pre-packaged programme.
2. It is context related, based on actual learners problems.
3. It has multiple entry points. There are no pre-requisites.
4. It is based on capability sharing of each so it is highly inter-active.
Moreover it uncovers what is already within.
5. It is non-institutional.
6. It is simple since it is not dependent on media or tools, at the same time it can be enhanced with the use of latest tools & technology. In the sense it is device independent.

A few representative exchanges between experimenting groups are shown here to give an idea of the way the open learning process takes place.

- I. This exchange is between a 12 year old girl from Khudawadi, Tal. Tuljapur, Dist. Osmanabad, Maharashtra State, India, who is a part of a group of destitute women, venturing on establishing their own resource right in the neighbourhood through Prayog Parivar methodology, in the 10 Guntha Autonomy projects.

Translated & abridged correspondence :

1. Letter from Varsharani :

13th April '95.

Dear Shri Dabholkar Sir,

1. Greetings from Varsharani. It is long since you visited us at Khudawadi. Sorry for this delay in communication.
2. As instructed by you, I have planted Gliricidia on a heap made from dry leaves and bio-mass. It is growing well. we have spread the neem sticks after soaking them in water. I found this experiment very useful.

3. Of the 10000 seeds planted, 5000 have sprouted. What is the reason for the failure of others ?
4. Even after watering the seeds twice daily with 500 ltrs. at each time, the seeds have not sprouted. What could be the reason ?
5. One spoon of ash from the leaf tips was also put in the bags. The sandalwood plants are drying out. I do not understand why ?
6. The Bamboo does not sprout at all.
7. I request you to come to Khudawadi again.

2. Reply from P.P.:

22nd April `95.

Dear Varsharani,

1. Received your experimental observations. They are well written. Do send such observations on the 1st and 15th of every month. Additional observations too are welcome.
2. You will get Rs.2/- for each observation to cover postage and paper costs. Use a large sheet. I am enclosing a copy of your first letter with some markings so that you will know how to write future observations. Every new point should be marked with a new number. It is easy to refer to the points in this manner. Keep a copy of each letter you send. I shall reply your letters pointwise which you can refer. Please collect the money for your letters from Seema. (Seema is the Project coordinator)
3. I understand that the Gliricidia has grown on the heap. This first sprouting is only on the sticks and there are no roots as yet. After another 3 to 4 weeks the roots will grow and there will be another new better growth.
4. Did you understand the reply in point no.2 ? Your comment in point 3 and 4 is good. You should sprinkle water daily, on the leaves spreadout. Do it lightly like rain.
5. As per point 3, the growth of seeds is half. If the seeds are not good, the growth is half or even less. Old seeds grow slowly. This too could be another reason.

6. As per point 6, while watering twice daily, see that the soil remains moist. This can be achieved even by watering once in two to three days. Excess water too can burn the roots. Bamboo seeds sprout late and old seeds do not sprout. Before the rainy season, entire clumps of bamboo can be planted.

3. Reply from Varsharani :

8th May, 95.

1. Received both your letters.

Please comment on the important points noted below :

1. I have planted 4 to 5 feet long sticks of Gliricidia in bags. They are growing well.
2. The Sandalwood & Custard Apple plants are still withering out. Please tell us the reasons.
3. Green plants have been kept under shade. They are growing well.
4. Please guide us whether to use fertilizers and which ones.
5. Manure from tender shoots is ready. Please instruct how to use this and for what purpose ?
6. Now the leaves are watered only once. I am still confused about how much watering is adequate. Hence please explain again.

4. Reply from P.P.:

15th May, 95.

1. Received your letter of 8-5-95. You have written your points well. Keep this habit regularly.

It is good that the 4 to 5 feet sticks of Gliricidia are growing well. Inform their quantity and plant more sticks every month on similar lines.

Did you understand that the leaves sprout before the root growth ? What are the maximum no. of leaves ? Measure the girth of the stem with a thread and count the length from a scale.

2. How many leaves do the Sandalwood and Custard apple plants have ? What is the height ? Does the whole plant wither or only the leaves ? Water lightly and increase the moistness.
3. How many leaves do the plants in shade have ? Have their roots reached the end of the bags ? On hearing from you, I shall instruct you how to move them on heaps in sunlight.

4. Since your sprouting from seeds is about 50%, the quality of seeds was average.
5. Which fertilizers do you intend to use ? Accordingly I shall inform you the quantity, ratio and time to administer them.
6. I understand you have prepared manure from tender shoots. From your observations it appears that 500 gms of fertilizer is obtained from 8 kgs. of dry leaves without burning them. For the time being store this in a plastic bag in an earthen pot. While making ash use only dry leaves. Leaves which are rotting cannot be included in the ash. Daily obtain medium to tender shoots of plants from the compound wall trees and other places. Dry them, rot them or burn them. Likewise spend at least one hour every day regularly.
7. Leaves should be soaked thoroughly initially, in a bucket or a pond. There after they should be kept moist by sprinkling minimum water.
8. Plants can be watered every alternate day. See that the water seeps in the bag. Do not just sprinkle on the top. The total water to be given in ten days is one fourth the amount of the total soil in the bag. Occasionally loosen the soil in the bag.
9. Show the copy of this letter to Seema and ask her to send her reply too. Keep a copy with you.

II. Initiation of exchange with a new interested experimenter : 5th May 96.

Dear Shri Dabholkar,

I have read your book 'Vipulach Srushti' and found that it contains highly valuable information for farmers. I am keen on becoming a member of your Prayog Parivar. Please let me know what I need to do so and what are the conditions to be fulfilled. I understand that you have also written books on grape and anjeer cultivation. Please let me know the price of this set.

Reply from P.P.

19th July 96.

Dear Vijay Patil,

1. Just Received your letter of 5-5-96.
2. I am enclosing an informative booklet on Prayog Parivar. It seems you wish to experiment around your house as a hobby or perhaps on a regular farm. After knowing your objective, we can inform you about the appropriate work methodology.

For experiments around the house, selection of crops like Groundnut, cucumber, sweet potato, corn or okhra are suitable for chain plantation (that is planting seeds at a frequency of ten days in 2 to 10 sq. ft. of space) and study over 8 to 10 months. On an average you should be ready to study 300 to 500 new points or concepts with each type of crop. After this study it is possible to achieve assured, calculated and record yields. A study of about two years is necessary for fruit trees. Initially you can register individually or as a group with P.P. by sending Rs.300/- covering 3-4 types of crops. For every new point learnt, Rs.2/- will be debited to the account and as the need arises, more amount would be sent as the learning progresses. A list of available publications is given below.

- III. Exchange with a well employed, established, young venturer in Gujarat - with very little space around his house, with no farming experience but with an earnest liking and pining for in-depth study to get assured, calculated, record yields.

Dear Shri Dabholkar,

3rd March 1996.

I was really happy to find your letter and booklet about Prayog Pariwar. Having gone through it, I found new light on the subject of people's education by self appraisal and scientific knowledge on non-professional basis.

I really wonder at 71 years of age you are doing this revolutionary social work of common man's upliftment without keeping any curtain of technical know-how and I am inclined to congratulate you heartily on your success.

I have remitted Rs.40/- for your book on City Farming and allied material through M.O.

But it is strange that in your letter you have not mentioned any financial implications of your teaching or guidance through post. I shall be delighted to know what expenses, and how it should be paid to you. At least the postal expenditure should have to be borne by us. Please kindly let me know.

And I am also pleased to be a member of of your 'Prayog Parivar', from this instant. Your condition that letters informing you on the subject of discussion should be continued to flow, I accept it and your most coveted replies will also be awaited more eagerly. Thank you.

Now, if you do not mind, may I come to my subject ? I have a terrace of about 500 sq.ft. over the tenements. On it I have spread soil over plastic sheets to avoid damage to the slab and I am trying to grow vegetables, but the soil is not so good, and only Palak grows because the salt proportion in soil is very high. So these first two years I am trying to lessen salt proportion by continuously growing Palak. Added some cow dung manure also, but still it's pH value is not enough. At first I would like to know how pH value can be determined ?

Secondly I am determined not to use any chemical manure, or pesticides. Please kindly show me any natural way without both of these.

The exchanges are between people of various backgrounds and interests. From well known, highly educated urban people to little known, under privileged people in small villages in remote areas. It just goes to show that this methodology has a very large range of applicability.

IV. Letter from Mr. Kantibhai C. Shroff, Excel Industries Ltd., Bombay.

Dear Prof. Dabholkar,

8th April, 1996.

By now you must have received our previous letter thanking you for the keen interest that you have taken on Deepak Sachadev's experiment.

As you know, we are also on a national scale highly involved on cattle care and one of the key issues that has been raised everywhere - is the cattle fodder. Narottambhai was telling me that you have also done some studies on the land requirement for taking care of healthy cow and that is roughly 3000 sq. ft. Can you help by giving us further datas for one of our goshalas so that we can exactly replicate the conditions.

Very very eagerly looking forward to your reply.

V. Letter from Mr. Arun Shourie, Journalist.

Dear Dr. Dabholkar,

What a great pleasure to hear from you. I have been a propagandist of your work and ideas ever since our meeting ! And better still our roof is now a lovely garden because of your example - the trees are 6' - 7' tall and the flowers are in full bloom. As my study is also on the roof, all these lovely things are a constant reminder of your pioneering work, and of your having brought joy to us so far away.

I hope you are well and as intensely at work as always.

VI. An accidental critical appraisal of this book by Ms. Gail Omvedt, social activist and proponent of Eco-feminism. The inclusion of the term 'Networking the Sun' and the genesis of 'Natueco Culture' is a result of this synergetic interaction. It is another example of the open exchange possible in P.P.

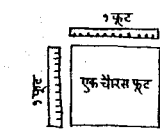

"..The good thing about your forgetting your bag is that I had a chance to go through your manuscript...I like the phrase 'harvesting the sun' but I think you need a catchier word than 'nature farming' - also your contrast with most environmentalist's 'natural farming' becomes clear on several points -

1. They are mostly a negative reaction to contemporary commercial farming and have a tendency to glorify the old way whereas you use science to build on the ecological principles of natural agriculture. (i.e. they would not like such terms as 'harvesting the sun', 'harvesting the sea' etc. because they think it implies too much control of nature whereas you see some necessity of scientifically guided control of nature.)
2. They have a tendency to see all of human productive history, from agriculture on, as destructive of nature, whereas you see it as building up ecosystems (at least at its best).
3. They speak in terms of 'communities' whereas you speak in terms of 'networks'. This is an interesting contrast. 'Community' has a nice, moral sound but very often these natural farming groups function under quite authoritarian leadership whereas your networks are built on maximizing and protecting individual initiative and self realization.
4. They dislike all talk of 'market' and 'prices' whereas you make suggestion for the healthy functioning of these. Actually I have been puzzled for some time about how, in their hatred of the market and capitalism, many environmentalists are going along with 'old left' ideology and confusing the state with the community, or so it seems.
5. There is a strong argument from some people that the seed is the key to all of agriculture, and Multinationals are set to gain control of seeds and so of Indian agriculture. Whereas you see the sun (& perhaps the human mind !) as central and as inherently uncontrollable !

Do you agree with this distraction ? In any case we can discuss when we meet next."

Use of Card System in interactions

The use and value of the card system mentioned in Chapters 2 & 3, is illustrated in the following pages, to give an idea of this process. A few cards which were used in the sixties are shown below.

<p>संपर्क पत्रक</p> <p>वेलाळा जोर दिव्यानंतर पुढील वीस दिवसात वेलाळा सहा-सात उत्तम फांद्या फोडता आल्या पाहिजेत.</p> <p>यासाठी लेकी - माती यांची संख्या योग्य रीतीने शोडें तोडून झपाट्याने कशी वाटवता असे त्याचे थोडे प्रामोदिक निरीक्षण एक-दोन वेळावर केले पाहिजे. म्हणजे कोणत्याही वेळावर अशी दुकूमी फूट घेता येईल.</p> <p>आपल्या वेलाचे ५० व्या दिवशीचे वर्णन पाठवल्यास अशी संपर्क पत्रके मिळू शकतील.</p>	<p>काही प्रयोग युक्त्या (मागील पन्नावरून)</p> <p>तरुणपण दुसरा टप्पा -</p> <p>वेलाळा फळकळी दिवू लागली की वेलाचे तरुणपण संपले असे म्हणता येईल. सरासरी तरुणपणाचा काळ एकूण आयुष्याच्या ३ असतो. परंतु हवामान वाईट असेल, झाडाची वाढ कमकुवत असेल तर हा काळ ३५ एवढाही वाढू शकतो.</p> <p>यासाठी तरुणपणाचा पहिला टप्पा संपताच वेत पूर्ण जोमाने वाटवा यासाठी वेळीच पुढील युक्त्या वापराव्यात -</p> <p>(१) वेलाच्या बुंध्यावर सकस मातीची भर घ्यावी व त्या-पूर्वी वेलाच्या मुळाजवळची मातीही चांगली शुसशुद्धीत करावी. मुळाजवळची सहा इंच माती मात्र हलवू नये.</p> <p>(२) पुरादे बाजारात मिळणारे नत्रयुक्त खत, अर्ध्या बादलीत एक चमचा खत घालून मुळाजवळ द्यावे किंवा जनावराचे अगर माणसाचे मूत्र अर्ध्या बादलीत एक टहान वाटी या प्रमाणात मिसळून द्यावे. थोडक्यात एक जोरखत पुरेसे सौम्य करून द्यावे. खत दित्यावर तीन दिवसांनी सर्व शोडें मारावेत व बगळडोळ्यातून येणाऱ्या लेकी मातीच्या शोड्यानी चाल घेतली की त्यांना चटण्यास तिरका मांडव व उत्तम सूर्यप्रकाश यांची सोय करावी.</p>	<p>सूचना पत्रक</p> <p>१) वेलाच्या पन्नासाव्या दिवशी बुंध्याला भरपूर मुळे फुटतील अशी काळजी घ्या.</p> <p>२) वेलाळा जोर येण्यासाठी नत्रयुक्त खते कशी द्यावी ते वंत्र जरूर पमदारे समजून घ्या.</p> <p>३) बाजारी खत न आणता घरशुती पध्दतीनेही अशी खते मिळवता येतात. याची स्वतंत्र पत्रके मिळू शकतील.</p>
<p>हे निरीक्षण करा</p> <p>लांबी एक फूट, रुंदी - एक फूट या रीतीने एक चौरस आस्वून घ्या. ती जागा म्हणजे एक चौरस फूट. या जागेत वेलावरची पाने तोडून ती वसवून घ्या. शोषकामध्ये असे एकच पान बसू शकते तर कारत्यामध्ये अशी ४-५ पाने बसू शकतील. पानाच्या आकाराचा व संख्येचा हिशोब उपेक्षित न करता नीट समजलेला पाहिजेत.</p>  	<p>परिचय पत्रक - १७</p> <p>एक चौरसफूट जागेत आठ तासात जेवढा सूर्यप्रकाश मिळतो तो प्रकाश वापरून त्या क्षेत्रफळाची पाने दिवसाला सुमारे ५ ग्रॅम साखर बनवू शकतात.</p> <p>म्हणजेच फळ वाढू लागल्यावर त्या फांदीवर असणाऱ्या आठ दहा पाने ते फळ पोसण्यापुढी साखर सहज बनवू शकतात.</p> <p>पानात रोज तयार होणाऱ्या साखरेपैकी ३ साखरच फळात साठवण्यास शिल्लक राहाते. कारण इतर साखर झाडाचे इतर भाग वापरतात. बहुतेक फळभाजीत ८५ टक्क्यापर्यंत पाणीच असते. पिवूळ पदार्थ अगर साखर ३ ते ४ टक्केच असते. अपवाद - कलिंगडाचा मधला गोड भाग.</p> <p>या कारणाने फळ पोसताना पाने एकमेकांच्या सावलीत न जाऊ, देता उत्तम सूर्यप्रकाशात राहातील असे पहावे.</p>	<p>फळाचा आकार, गोडीसुखद फळाच्या जातीवरच अवलंबून असते. यामुळे जर उदात्त आकाराची फळे असतील तर ती फळे या प्रमाणात संख्येने जास्त येतात. मोठ्या आकाराची फळे असतील तर ती संख्येने कमीपण वजनाने जास्त असतात.</p> <p>मोठ्या आकाराची फळे असूनही जर एकदम जास्त फळे लागली तर एकूण वजन सरासरीने सर्वात वाढते जाईल.</p> <p>सरासरी वेळाने किती चौरसफूट जागा व्यापली आहे ते पहावे व त्यावरून एक चौरसफूट जागेत किती दिवसात त्या वेळाने कमीत कमी एक किती वजनाची फळे दिली पाहिजेत. कारण त्या वजनापैकी ८० टक्के भाग पाण्याचा असतो व सुमारे ४ टक्के भाग साखरेचा. पिवूळ पदार्थाचा १ टक्का प्रथिनांचा व १ ते ४ टक्के भाग काळवंतूचा असतो.</p> <p>शिवाय बिया जून झाल्या असतील तर त्यामध्ये मोठ्या प्रमाणावर साखर प्रथिने व फस्फातंय गोडतेत असतात. या बियांचे वजनही एकूण फळाच्या पाच टक्के</p>

<p>पराग सिंचनासाठी फडफुलाची व साध्या फुलाची नीट माहिती असली पाहिजे ती पुढील प्रमाणे -</p>	<p style="text-align: center;">संदर्भ पत्रक - २</p> <p style="text-align: center;">पराग सिंचन</p>	<p style="text-align: center;">निरीक्षण पत्रक</p> <p>विविध जातींच्या (काकडी, दुध्या भोपळा) वेल भांडीच्या साध्या फुलाच्या पाकळ्या काढून निरीक्षण करा.</p> <p>या पाकळ्या सुट्या असतील तर पाचपच असतात व पुष्प फेऱ्यासारख्या असल्या तरी त्या पेल्यात पाच भाग स्वतंत्र दिवू शकतात. या पाकळ्या काही जातीत (काकडी दोडक) पिबळ्या व काही जातीत (दुध्या भोपळा/पडव) पांढऱ्या असतात.</p> <p>पाकळ्या काढल्यावर आतील जाळून परागपीठ देणारा गोकीदार अगर हांड गोकीदार भाग असतो. जरूर तर दाखणीचे हा भाग काढून घ्यावा. याची नसत पत्रके घोराने मिळू शकतील.</p>
<p style="text-align: center;">साधे फूल</p> <ol style="list-style-type: none"> १) फुलाचा देठ वेग किंवा लांब. २) फुलाची बैठक. ३) फुलाच्या पाकळ्या. ४) फुलाच्या आतील परागपीठ देणारा भाग. ५) यासेरीज मध द्यादी देणारा भाग असतो. 		

The evolving nature of 1. Interactive 2. Involved 3. Innovative communication, assessing at every stage, a two way evaluation, through credit points is worthy of study through one recent communication with an enthusiastic marginal rural womens study group.

The promise of this method makes each individual capable of taking Calculated, Assured, Record yields in any crop of his liking on his own.

Crops in the Red Pumpkin group (Cucumber, bottle gourd, ridge gourd, bitter gourd, watermelon etc.) are popular with rural groups and they strive for achieving record yields. (Some have achieved even 3 kgs. in 5 sq. ft.)

Taking this crop as the context, the cards on the following pages illustrate the process.

This first set of interaction is of about 5 to 6 cards :

1. Observation Card

The watchword of PP Network is "Our own inquisitiveness is our real Guru."

"Our innovative experimentation is the only real school" and

"The success in our pursuit is the real examination."

1. Break the seed.¹ See the seed coat.²
2. See the embryo and its two parts - the root³ and the shoot.⁴
3. See the two cotyledons.⁵

- Each card has several concepts having certain learning points which have to be internalised. These are indicated with numbers like ¹.
- 5 credit points to be learnt.
- Report accordingly.

2. Experimental Card

Each credit point is taken as equivalent in monetary terms to a minimum of value of Rs.2. to a maximum value of Rs.50.

However this worth is never taken in cash but mobilized in creating credit and goodwill and exchanges in kind. (e.g. nursery plants, field visits etc.)

1. Collect a heap of soil¹ about 4 litres² by sweeping wasteland³ topsoil⁴ and filling a bag or a pit,⁵
2. Sow 2-3 seeds⁶ with light watering.⁷

- 7 credit points to be learned.
- Worth in monetary terms is Rs.14.
(This is deposited as learning value and not as cash exchange)

3. Observation Card

1. After sowing, the seed germinates in 3-5 days.¹ Then the root part emerges out of the seed.² Then a small outgrowth presses the seed coat³ and the cotyledons come out.⁴ The cotyledons spread out and become green. Observe how many days are required for this growth.⁵
2. This whole process completes in 5 days after sowing.⁶ The first two leaves are not true leaves,⁷ but cotyledon leaves,⁸ and the real shoot is in between the two cotyledon leaves.⁹ Search for the real shoot part of the embryo between the cotyledons.¹⁰
3. If the seed does not germinate, it is not a good seed,¹¹ or the temperature is not helpful.¹²

Full set of cards are available.

- 12 credit points to be learnt.
- Each of the points in the cards become a hook to branch to lateral levels or deeper levels according to users needs.

4. Observation Card

1. The first true leaf of a red pumpkin is seen on the third day after germination.¹ Observe how it grows to its full size in the next 4 to 5 days.²
2. By that time the second true leaf emerges.³ It also takes 4 to 5 days to mature.⁴ By that time a third leaf emerges.⁵ Thus the first five leaves emerge at an interval of 4 to 5 days.⁶ So the total time of growth of the first five leaves is about 24 to 30 days after germination.⁷
3. We call this the 'Tender Stage' growth of red pumpkin.⁸

The variety Poona Cucumber is a good crop of this type for study, as it yields its first fruit within 36 days of germination.

- 8 credit points.
- A Learning exchange can have several types of cards as shown in chapters 2 & 3.

Diagram cards
available.

5A. Information Card

1. Every seed has its 'Tender Stage' growth,¹ which is about 1/5th of its total life cycle.²
2. In the red pumpkin crop the total life cycle is about 120 to 150 days,³ as per variety.⁴
3. Each stage of growth has certain characteristics.⁵ After the tender stage comes the 'Young Growth Stage'.⁶ In the beginning of this stage, the tendrils emerge,⁷ and the vine begins to spread at every growing point.⁸ One internode, one leaf and one tendril growth takes place every day.⁹ Thus the red pumpkin vine will have 10 new leaves in the next 10 days,¹⁰ after its initial 5 leaves in 24 days and so on.¹¹

- 11 Credit Points
- A proper observation card is available on demand or you can develop your own.

5B. Information Card

1. Each leaf consists of two parts : 1. Petiole and 2. Blade.¹³ The petiole is attached to the stem.¹⁴ This place is called the node point.¹⁵ The distance between two nodes is called internode.¹⁶ So every day, there is one internode, one petiole and one leaf blade growth in vine crops of red pumpkin type.¹⁷ In some plants the blade is of compound nature. (As in the groundnut leaf.)¹⁸
2. At the internode between the axis of the petiole and the stem, the flower buds¹⁹ and the vegetative buds appear.²⁰
3. All these growths : Internode, Node, Petiole, Blade, Vegetative bud & flower bud have again their five stages of growth - tender, young stage etc.²¹ It is very interesting to understand & learn these details to obtain calculated, assured and record yields.²²

Details available
in form of
sketches, tables,
Multi-media,
Audio-Video
materials.

- 11 Credit Points
- This information should be internalized through observation & interaction.

6A. Inference Card

1. After germination, every new leaf coming should be of bigger size than the previous size, at least double.¹ Thus the second leaf will be double the first² and the third leaf will be double the second³ and the fourth leaf will be double the third⁴ and the fifth leaf a full size leaf of red pumpkin.⁵ Afterwards all the leaves after 5 days of full growth will be of this same size as of the fifth leaf.⁶
2. This is the growth of a vigorous good plant.⁷ If our growth fails to tally with this growth pattern, you can study the reasons⁸ by uprooting the plant,⁹ by studying the flush of white roots in the soil¹⁰ and by improving the soil tilth (fully composted component)¹¹ in the right proportion in the right place.¹² A vigorous red pumpkin plant always has a full flush of white roots in the entire soil.¹³ (4 litres)

Details available.

- 13 Credit points.
- Thus by drawing proper inferences at proper stages of growth it is very easy to improve our soil fully.

6B. Inference Card

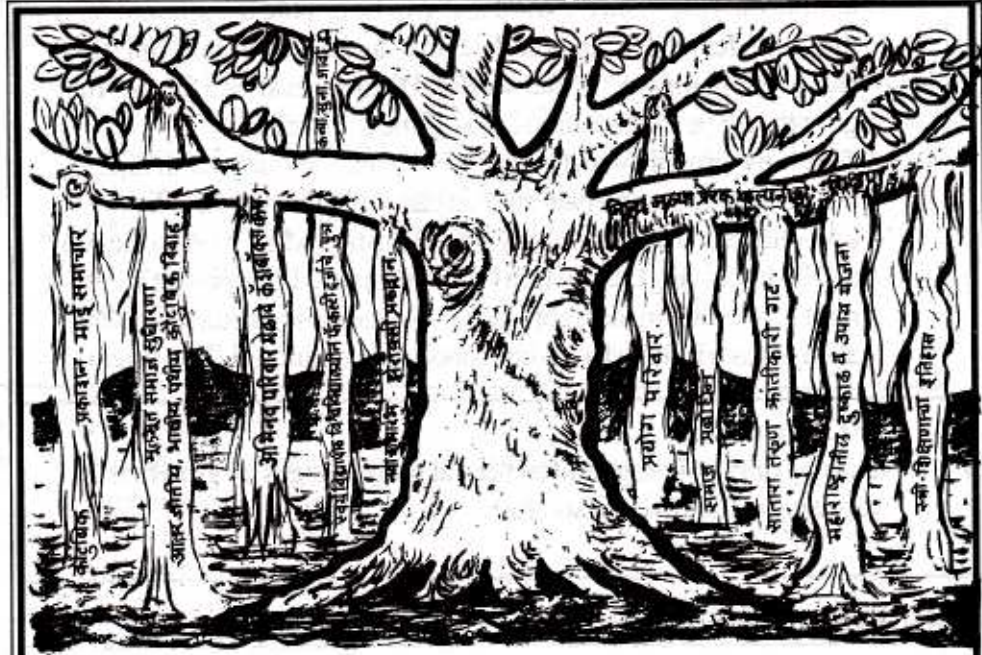
1. Second inference is that excess¹⁴ or less water can also spoil the flush of roots.¹⁵ So also the temperature,¹⁶ less aeration etc.¹⁷
2. If inspite of good flush of roots, the leaves are not doubling in size¹⁸ the nutrient level is to be adjusted.¹⁹

Various methods available.

- 6 Credit points.
- In all 15 to 20 such sets are required to be internalized to obtain record yield.
- This process really builds the scientific dialogue.

Network Exchange within the family

This form of communication exchange has been in use within my family for couple of years. A regular internal news bulletin 'Mai Samachar' networked



नित्य नव्या प्रेरक कल्पनांचे व गोष्टींचे शिक्षण

माईच्या आहार, विहार आचार इत्यादीत नित्य नवे प्रयोग करण्याच्या व माधुनिक गोष्टी राखण्याच्या आदर्शांचा नव्या जोमदार पारंब्या म्हणजेच "समाज प्रबोधन, प्रयोग परिवार, सातारा तरुण-क्रांतीकारी गट, स्त्री शिक्षणाचा इतिहास, महाराष्ट्रातील दुष्काळ व उपाययोजना व अनेक मासिके, वर्तमानपत्रे यातून बंडा-नरेंद्र-नीचाळविलेले नवनव्या स्वरूपाचे शिक्षण होय"

नातू मेळावे

एका नव्या स्वरूपाच्या विकेंद्रित-प्रवाही नातू मेळाव्याचे संयोजन सातारा, कोल्हापूर, गारगोटी या तीन केंद्रातून या उन्हाळ्याच्या सुटीत होणार आहे. यामुळे सर्वजण निरनिराळ्या ठिकाणी मुक्काम करून तर रहातील. यण त्याबरोबरच दहा दहा दिवस एकत्रपण येत जातील अशी खात्री आहे.

डीला, नरेंद्र, वृन्दा, मुकुंद, माई यानी यात पुढाकार घेतला आहे.

अशीच योजना कोटा, फगवारा लाईनवरपण करावी अशी सूचना दिग्-प्रकाश व बंडारा गोटातून आहे. नातवंड-नो हुशियार !

amongst the family members (now almost 100 !) spanning three generations, is a source of family pride and warmth, worthy of emulation in any family. A few pages from this informal newsletter published in 1974 by the grandchildren on the occasion of their grandmother's 70th birthday.

<p>शुभ संक्रमण शुभ संक्रमण</p> <p style="text-align: center;">माई समाचार !</p> <p>माई या संक्रांतीच्या माई समाचारने प्रगतीची पहिली दोन वर्षे मोठ्या दिमाखात पुरी केली. या काळात समाचारची लोकप्रियता तपासण्यासाठी अनेक टेस्ट घेण्यात आल्या. अगदी गेल्या दोन महिन्यात या नवे घेतलेल्या कसोटीत या अंकाच्या प्रकाशनात सर्वांनाच केवढी मोठी आत्मीयता आहे हे परत लक्षात आले.</p> <p>✱ बामुळे या समाचारचे पाकिट व साप्ताहिक समाचार स्वरूपात प्रकाशन करण्याच्या अनेक नाविन्यपूर्ण योजना आता आरवण्यात आल्या आहेत याचे स्वस टार्पत्रक काढण्यात आले आहे ते मागून घेऊन सर्वांनी यातील विविध योजनांचा लाभ घ्यावा व सहभाग द्यावा.</p> <p>✱ माई समाचारचा हा नवा संक्रमण अंक माईचा सतरावा वाढदिवस अंक म्हणून खास स्टॉलने प्रकाशित होत आहे. सर्वांनी या प्रकाशनावरचे आपले खास अभिप्राय जरूर पाठवावेच.</p> <p>✱ चाहू अंकाबाबतचा कॅशबॉक्स यावेढी मुकुंदने घेतला आहे. अशाच स्वरूपाचे अनेक कॅशबॉक्स नियोजन आता या केंद्रातून होणार आहे. तरी त्याप्रमाणे बाबा, आई, काका, काकी, मामा, मामी, श्री. व सौ. मावशी यांनी आपले संकल्प एकठांवे अशा कॅशबॉक्समधून चाहू अंकाच्याच स्वरूपाचे 'मातवंडे कथाविश्व अंक', 'मातवंडे संपादित अंक', 'मातवंडे मेळावे अंक', 'मातवंडे खोऱ्या खोऱ्या व पराक्रम अंक' 'खास विशेषांक' इत्यादी खास अंक निघणार आहेत.</p> <p style="text-align: center;">- पत्रातून आलेल्या काही नव्या कल्पना -</p>	<p style="text-align: center;">फगवाता १६-१२-७३.</p> <p>माई समाचारमध्ये नित्य नव्या नव्या घडणाऱ्या गोष्टीवर विशेषांक निघवत. हिमालय ते मेक्सिको-याना यादरम्यान असाच विशेषांक काढावत.</p>
<p style="text-align: right;">कोटा २५-१२-१९७३</p> <p>माझ्या मते माई समाचार हे फार आवडायला काम असल्याने स्वयं विहीने ते मानधन प्रेमोपहार वगैरे घेऊन ते काम दिवास्वला वाढवणे व ते काम चकीपध्दतीने सर्व मातवंडांनी आपल्या ठिकाणातून संपादित करून प्रकाशन केंद्राकडे पाठवणे व प्रकाशित व्हावे. माई समाचार अंक उत्तरी उशीरा निघवत तरी फारच पंचवर्त होणे. यापूर्वी अभिहितने याबाबतीत केलेल्या कमावतले खासा काही मोठे लक्षिस देण्याचा विचार आहे.</p>	<p style="text-align: center;">सिद्धार्थनगर गोरेशाव १९-१२-७३ १९-१२-७३ वी.मुकुंद म्हुचना</p> <p>माई समाचारातील प्रमुख पत्रक माई जैश्विके वेचून जते वेळ तसे छापवे. इतर पत्रे संकलन करून काढण्यास हरकत नाही. पण हे संपादनाचे काम मात-कंपनीनेच करावे.</p>
	<p style="text-align: center;">जळगाव २२-११-७३.</p> <p>वाढदिवस ग्रेट योजनेला अधिक प्रभावी नवे वळणाचे विधायक स्वरूप द्यावे अशी माईची कल्पना आहे. याबाबत मातगोपाठानीच पुढाकार घेऊन योजना वाढवावी.</p>
	<p style="text-align: center;">शारदोदी २-१-७४</p> <p>फगवाता, कोटा, गोरेशाव म्हुचनेप्रमाणे मातचमुने हे माई समाचार कार्य व विशेषांक प्रकाशन कार्य अंका कर द्यावे. माई वाढदिवस ग्रेट योजना व नव्या योजनेत बापवकी. 'शिवाय' या चकी अंकास चांगले ठरणाऱ्या अंकास काळज, ममा, आता माईनी स्वयं बक्षिसे द्यावीत.</p>
	<p style="text-align: center;">ए.बी.दाहा व भावी मुंबई १८-१२-७३</p> <p>माई समाचार सर्व अंक आम्हाला हवेतच. मुकुंद, आमचे खासाडी काम नोदवून ठेवच.</p>
	<p style="text-align: center;">माई आत्मचरित्र प्रकाशन</p> <p>या अंकाच्या प्रकाशनाबाबत वापरलेल्या हेरॉकसी प्रकाशन तंत्राचा कसून माईच्या आत्मचरित्रातील विविध प्रकरणे ता. प्रकाशनतर्फे आकर्षक-रितीने प्रकाशित होत आहेत. दर महिन्यास काही भाग प्रकाशित होत क्रमाने हे भाग प्रकाशित होत जातील.</p> <p>आपण प्रयोग करू या हेही एक नव्या वळणाचे प्रकाशन या मागोमाग प्रकाशित होणार आहे.</p> <p>तुंदाने पण अशाच स्वरूपाच्या नवदा, जबा यांच्या लेखना धरून पहिले टायल प्रकाशन काढण्यासाठी खूप अधिक तरतूद केली आहे.</p> <p>प्रकाशन होवोी सर्व दाभोडकरानी आपले पाठवत, विचार व योजना या संदर्भात पाठवाव्याच.</p>

Every fortnight all the mail received by 'Mai' is circulated amongst all the family members in the exchange.



माई आजी करते तशी खातोळी कर
श्रीरामपूर ४ - १० - ८४

प्रिय माई आजी
लिखू मावशींनी पाठलेली ११ रुची मनि-
झोर्डर मिळाली मला बंधू आनंद झाला. सध्या
मी टीसे लसेच ठेवले आहेत. नंतर त्या पैशानी
मी कान रोचणार आहे.

बाबा सध्या औरंगाबादला गेले आहेत. औरंगाबा
दहून येताना बाबा महा वाढदिवसाची भेट म्हणून
जोडपारी आणणार आहेत. बाबा ५-६ तारखेला येतील.
तुझी, नरेंद्र मामाची व शैलामामीची तब्येत कशी
आहे? पत्र पाठव मला तुम्हा सर्वांनी आठवण येते.
सर्वांना साष्टांग नमस्कार.
२०५१ ANASOOYA

वाढदिवस
तुझी माझा धाव आहे धावेकडून धावेपुढे

प्रिय माई आजी
वाढदिवसा निमित्त खास शुभेच्छा
स्वरोपेकरच ले चाक [आम्ही त्याला धाव
म्हणतो] आणताना पाहून विचारे येतून जाणारे
आम्ही फिदवले - गारगोटी कोठेपर्यंत सोडवत एक
एक मैलावर गावे आहेत. यांमधून जाणारी रस्ता
आहे. मी व माझा मित्र त्या रस्त्यावरून वला नापूर
कुनाकुवाडी. इनकरवाडी इकडे फिरतून आलो
मिनाच्या शेतात उरून शिगा रथाच्या काळ-
पण तिकडेच गेलो होतो अशी तात्या
लिखून करिता भरपूर उबा आणता.
आजही कोठेतरी धाव घेऊन जाईन.
खिशातार्थाने रेकॉर्ड घेत आ-
णली आहे. काळगती

खराच वेळ एकट बसले होवा. मीला ज्ञानेश्वरी घांज्या ह्या
रेकॉर्डस विच्यकडे आहे. कितीतरी वांगत्या वांगत्या रेकॉर्डस
तिच्याकडे आहेत. असो.

आताच दादा, नरेण्ण, दादाचे 'राजाज्ञा' व नरेण-
आणणाचे 'मित्र' दोनवेडे नामक एका गावी सफर म्हणून गेले
आहेत. तिथे कडेवगेरे आहेत. म्हणून तेथील मिसर्स सोदीय
पाहण्याकरिता सगळे गेले आहेत.

माझी गोष्ट आता पन्नास नजे पूर्ण झाली आहे. अजून
किडल व्यायची आहे. बाबा तुला घामचे विचरेले होते.
कवंब्याच्या हौदात मला काही रंगीत मासे सापडले आहेत.
तिकडून गेलेले तुम्हास बंधू आणणा रवेच वाढे.
परीक्षेचा रिझल्ट लागला ८६% मार्क पडले.
प्रकृती कशी आहे? इकडेचे सर्व ठेक. शैलामामी व नरे-
ण्णका काय म्हणतात? देवस्थाना खूपच भरभराटीला आता अ-
सेक. नरेण्णका, तू मेघरसायकडून स्पष्टीत आम घेवईत अशी
आशा वाटते. बाकी इंदिरागोटी चोद्यागोटीत जेही लेखा तरा
मेगेलची बचत करावी. — तुम्हा प्रतिज्ञा

तव आशीश तो डरना क्या
मा र गो ही

प्रिय माई आजीस,
जगाच्या पायांने विवर्कत हे पत्र लि-
हीतोय. कायच सहलीला गेलो होतो. एक दरड
उतरताना तिच्यावरचा मोठा दगड कोसळला. त्या
दगडावरचा माझा पाय चेंगरला. सर्व प्रथमोपचार
झालेयत. हा आठवडाच अपघाताचा दिवसोय कारण
मायकडीला तुझी नवी रीत घालत त्याच दिवशी
सामकडीच्या पुढच्या चाकात एक दगड अडकून साम-
कड पडली. येपही. लेकिन अरे! डरने क्यों हो? मला का-
हीही शयं नाही. सुदैवाने.

वाढदिवसानिमित्त शुभेच्छा.
शैलाकाकीला म्हणावे 'जंगलमे मंगल' म्हणून
भूत (अरे बापरे!?) स्वप्नात येत का? एकदा तुमच्या
बुलेटवरून गारगोटीला या.

सुधीचा उन्माद ओसरलाय. शाळा सुरू शाहीय
नवीच अभ्यासक्रमामुळे आता मे महिन्याचीवय सुधी
नाही. पत्र लिहित्यामुळे आता पाय बरा आहे. नाहीतर
शैलाकाकी येईत औषध घेऊन. डोवठी पुन्हा
HAPPY BIRTHDAY TO YOU!
अभिजित

Translated copy of the newsletter is available.

RESOLUTION

submitted to the
United Nations
in the
International Year of the Family,
December 1994.

The Indian Initiative for International Year of the family (IIF/IYE) was an NGO response to the call of the United Nations to observe 1994 as the international year of the family. During ten months of its work, it was able to activate more than 4000 individuals and voluntary organisations to take steps in the direction of making as many families as possible to move towards self sustaining living.

We have shown that by using scientific knowledge it is possible to lead a self sustained life at higher middle class income (Indian Standards) level with

1. 1000 sq. Mt. (10000 sq.ft.) of sunlight
2. 500 liters of waste-water of a family of five per day
3. Latest scientific know-how carried unto the last individual through venture developments amongst the masses, through demystification and deprofessionalisation of science by Prayog Pariwar method.

For achieving this aim of I. Y.F. the following resolution was passed on 29th / 30th December 1994 and was submitted to the United Nations for necessary action.

Resolution :

"Resolved that the United Nations should recognise minimum resource base for sustainable living as the **Basic Right of Every Family** and declare the coming ten years as the **Decade of the Family** for enforcing the right."

Let each one
on one's own,
strive to
experiment
with zest,
to innovate
and propogate
various
new ventures,
in every nook
and corner
of our planet.

"The Prayog Pariwar is a living pulsating organism of experiments. Hundreds are at a time exchanging information arising from live experiments of the participants. Information flows freely. Everyone in the network has access to it. Long before the Internet as we know it, Dabholkar and his Pariwar had instituted an Internet-on-postcards"

- **Arun Shourie**
Journalist

"These ventures have the real potential to resolve the global problems of Waste Minds and Wastelands, and to create Plenty for All in each one's neighbourhood."

- **Annasaheb Sahastrabuddhe**
Veteran Gandhian leader

"I am enthused with the idea of Cell of Prayog Pariwar and Venture generation among the masses by working 'with' the people. This is a new breakthrough in the field of sociology of science and education, to bring prosperity to all."

- **Baba Amate,**
Veteran Social Worker

"Prof. Dabholkar's interest extends beyond agriculture and mathematics to several other areas of deep concern like philosophy. He is an extraordinary, talented individual, in short a prodigy. Today his knowledge is being used according to market economics to increase wealth through cultivation of grapes and sugarcane. But utilizing this knowledge, the concept of Gram-Swarajya or Autonomous towns and villages is possible making each individual or societies independent, self-reliant and prosperous."

- **Thakurdas Bang,**
Sarva Seva Sangh

"Energy with the help of cattle power can become a great subject of study. A number of our engineers are thrilled with the idea. Opportunities are great, like the shift from Hydrocarbons to Carbohydrates. Again we visualize the shift to cattle power providing clean electric energy as 'Nandi Urja' to each rural household."

- **Kantibhai Shroff,**
Excel Industries

"I would like to help you to help others to produce food etc. on a national scale, at least a wider scale."

- **M. G. Bhatt,**
Industrialist



Mehta Publishing House