SOCIAL ECOLOGY: A BLEND OF SCIENCE AND SUBTLETIES

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Stuart Hill, Professor of Social Ecology at the Hawksbury Campus of the University of Western Sydney, describes himself as a social ecologist.

A more accurate description might be a catalyst for change. But then, according to Professor Hill, ecology is about how systems work and social ecology is about learning to work effectively with those systems, particularly when change is occurring.

Professor Hill brings an intriguing mix of qualifications and experience to bear on the challenges facing society.

An ecologist by inclination, he has formal qualifications in agriculture and psychotherapy -- how humans work and with interests in organic production systems and things political -- a key element in how any society operates -- filled out with practical experience in agriculture and natural resources management.

"My primary interest is in ecology - how systems work - but I have professional and personal interests in the personal, social and environmental perspectives of social change."

He arrived at Hawkesbury via Canada where, as a Professor in the Faculty of Agriculture at McGill University in Montreal in the 1970s, he was horrified by the way agriculture was taught and the fact that other faculty members were not aware of the wealth of information available about alternative production methods, including organics and biodynamics.

At that time he was also teaching evening classes in organic gardening and farming and, prompted by claims from McGill Faculty members that there was no scientific information about organic production methods, he established Ecological Agriculture Projects (EAP), which developed into the world's largest reference centre on organic farming systems and related technologies.

He was Director of EAP, which provides information covering areas as diverse as the quality of organic food, how to convert to organics and the relationship between the different alternative systems approaches, for more than 20 years until he moved to Australia in 1995 to take up his current position.

While he still has an active interest in the field of alternative production systems, he is no longer involved in EAP although his publications can still be found on their web site at http://www.eap.mcgill.ca
Since coming to Australia Professor Hill has developed a particular interest in grazing -- the biggest single land use in Australia -- and rangeland ecology and works as a consultant to Terry McCosker's Resource Consultancy Services and its grazier clients around Australia.

But his focus remains 'the big picture', the interrelationships between issues and a holistic approach, in contrast to the more common, reductionist, segmented approach favoured by conventional science.

"Part of the problem is that conventional science fragments problems and looks at them in segments rather than as a whole.

"Take energy, food quality and rural decline, for example. They are invariably dealt with as separate issues, but in reality they are all interrelated; to such an extent that if you find the right solution for one there is every likelihood you'll help solve all the rest too.

On the other hand, if you try to solve any one in isolation it is likely that over the longer-term you will impact adversely on all the others.

"What is needed is a holistic approach, but we have a long way to go to achieve this."

Which takes him to another area of interest: the process of change.

"Many years ago I developed a model for change, which I dubbed the 'ESR' model.

"ESR stands for efficiency, substitution and re-design, which describe the three dominant approaches taken to change, whether it is change in agricultural systems or change in the wider society.

"The efficiency approach involves finding ways to make a conventional solution to a problem more efficient.

"With spraying, for example, the efficiency approach might involve improving nozzles, improving formulations, using Integrated Pest Management (which usually is just Integrated Pesticide Management) to reduce the amount of chemical used, and so on.

"Efficiency is an interesting issue.

"There is room for huge improvements in efficiency on almost any level you like to look at, from energy use in homes and industry to pesticides in agriculture.

"Pesticide use is incredibly inefficient. Usually less than one per cent of pesticides applied to crops actually reaches the target. The rest is wasted and creates havoc in the rest of the ecosystem

"Some aspects of business are not much better.

"A group of appropriate technologists from across the world, who met in France in the mid-1990s, calculated that there is scope to reduce resource use to one tenth of current levels through achievable efficiencies using current concepts and technologies; which they dubbed 'Factor 10'.

"But to be pragmatic they settled on a 75 per cent reduction as an acceptable target and subsequently a book on the concept was written - describing how some major mainstream companies had achieved this -- titled 'Factor Four'.

"One of the concepts they came up with was an economic system where capital items, from houses to cars, would be rented, rather than bought.

"They argued that car manufacturers should be responsible for the vehicles they produced for the life of the vehicle. Not only would they design and make the cars, they would also maintain them and rent them to whoever needed a

vehicle; which immediately removes the incentive to build in obsolescence, to make parts expensive, and so on.

"If manufacturers were responsible for maintaining the vehicles, and were reliant on rental demand for their profits, they would build a durable, repairable, efficient product because it would be to their benefit.

"Building a car to sell is an incentive to build in weaknesses and obsolescence."

And the system could work, even in our society, as demonstrated by one company in the US who is successfully, and profitably, renting carpets instead of selling them, he said.

"While efficiency focuses on improving the current inputs and methods, substitution involves replacing the current inputs to the system with less impacting or disruptive ones.

"However, our problems can only really be solved when we start to re-design the systems so they don't give rise to the problems being addressed by the use of inputs.

"In this context re-design is a 'deep' approach compared with the more 'shallow' strategies of efficiency and substitution.

"Re-design addresses the underlying issues by re-designing the system so the problems -- symptoms of a flawed system --conventionally addressed by efficiency and substitution solutions, do not arise."

The efficiency and substitution approaches can be either stepping stones or stages in a progression or they can be barriers, with substitution, in particular, often becoming a barrier because it makes the system appear workable, at least in the short-term, and because it involves so many vested commercial and political interests, Professor Hill said.

"Much of organics is heavily into substitution, with chemical fertilisers being replaced with acceptable nutrient inputs and 'natural' sprays or biological agents instead of chemicals.

"Organic producers are importing humates, seaweed sprays, biological control agents and even micro-organisms; all of which are providing benefits which could be created on-site if the system was operating properly.

"Many people think that by using these products they have found the solution to their problems, but there are many, smarter things to do that don't need these substitute inputs, which one is stuck with having to repeatedly purchase.

"For example, if you have enough decomposition of organic matter occurring in the soil you get the production of growth promoting cytokinin hormones, which are one of the key benefits that seaweed products are providing.

"And humate-like substances are also produced as a result of healthy organic matter decomposition. Why import humates instead of getting the management of your soil organic matter right?

"The problem with imports is that their benefits are always temporary. The source or resource they are made from will always eventually run out, so a system dependant on imports is never sustainable.

"But it's OK if it is a stepping stone to re-design, which in the case of a food production system might involve use of companion crops and the production of crops in sites where they are well-suited and will grow strongly and well without the support of imported inputs.

"If we are to head down that path there is a progression from deceptive simplicity, in which we think pesticides and fertilisers are the solution, to confusing, and sometimes paralysing, complexity, in which we try and measure everything and find an explanation for it, even though we can never achieve that, and on to profound simplicity, which usually involves a paradox, in which we let go of the need to measure and control, and are free to tune in to the natural systems."

Despite much talk about the need to re-design Australia's dry-land farming systems, action in mainstream agriculture and environment has up to now largely been limited to efficiency and substitution strategies, he said.

"Almost all the current research projects to 're-design' Australia's farming systems are not really about re-design at all, but are aiming at minor modification of current systems, which is not surprising, given the level of industry representation on the advisory committees and other groups who determine the decisions being made about research projects and funding.

"Almost all research funding these days has to be matched by industry, and industry is interested only in efficiency and substitution solutions to problems because its commercial priorities relate to the sale of products.

"Consequently, industry representatives have no interest in re-designing systems to be self-sustaining because it is not in their interests as there are no products to sell."

Even CSIRO farm system design projects were at best shallow, he said, although he senses a lot of the researchers have a good grasp of the concepts and would like to be able to focus on the re-design of our production systems.

"But there is no support for genuine re-design because of the industry linkage with the funding and the advisory boards, which are heavily peopled with industry representatives."

However, system re-design is not being completely ignored.

"There are re-design strains outside the mainstream, with Permaculture, Fukuoka's concepts, biodynamics and deep organics, all being about system re-design one way or another.

"Some of the traditional food production systems in Indonesia, Africa, South America and PNG, for example, also provide models worth exploring for alternatives to the modern industrialised approach currently used in Australia.

"I would like to see what could be achieved by combining the best elements of those systems with a sound understanding of ecological principles.

"There is also a lot to be said for bio-mimicry, in which we copy nature's solutions and processes.

"Natural systems work, so it makes sense to learn from the way nature does it and mimic nature instead of inventing something based on physics and chemistry.

"That's what I would like to see happen with the redesign of our food production systems.

"Look at nitrogen fixation, for example. Soil fixes nitrogen non-stop through various mechanisms; until we add nitrogen fertilizer, which makes the natural systems redundant, for a while.

"The problem is that the nitrogen fertiliser inhibits the nitrogen-fixing organisms so they stop work, and we no longer get the free nitrogen from the air.

"I believe we should be looking at managing land in strips with alternate strips that are high and low in nitrogen.

"Low levels of nitrogen in biologically active soils are the ideal conditions for nitrogen fixation, so the low nitrogen strips can be left to build up nitrogen levels. The crops are grown between the high-nitrogen and low nitrogen strips so that their roots have access to both areas.

"Nature works with complex systems and thrives on diversity, which is the opposite of the homogenised approach taken in modern agriculture.

"If everything is uniformly, and artificially, high in nitrogen added as fertiliser you don't get the free nitrogen from the air. This is only possible by designing and managing a system that works with rather than against the natural cycles and processes."

Professor Hill believes the lack of government funding for genuine re-design of production systems is the underlying problem impeding progress towards genuine sustainability in Australian agriculture.

"If we are to develop sustainable systems we will need the community to pressure the government to initiate programs for fundamental re-design. This is the only way we can significantly relive our wasteful levels of consumption."

Modern farming systems are an un-natural inversion of nature's systems, Professor Hill said.

"With respect to food quality, most of the processes in commercial farming systems result in the loss of nutrients, and the addition of toxins, in the forms of sprays and chemical fertilisers.

"For example, there is often little attention paid to matching the crop to the site, which is important to achieve optimum crop quality."

Most "modern varieties of fruits and vegetables are selected for high yields, shelf life, appearance and their ability to be mechanically harvested; not on the basis of nutritional value.

"If you compare the nutritional value of the common varieties of the crops we grow today and the modern commercial lines, most of the early varieties win hands down.

"The nutritional value of most modern varieties are pathetic.

"Plant breeders know growers get paid by weight, not nutritional value, and the best way to increase weight is to add water.

"If you take the original variety and breed a plant that retains 10 times more water you get 10 times the yield and one tenth the nutritional value per unit, because you get the original nutrient level diluted with the additional water.

"Then, because the crop is being grown on the wrong site the grower has to add nutrients to maintain production which, particularly where a basic N, P, K approach is used, throws the system out of balance and further diminishes the nutritional value of the produce, as well as making the plants more susceptible to pests and disease, which triggers the addition of toxins in the form of pesticides and fungicides.

"The outcome is further worsened by the fact that the produce is then harvested, not when it reaches its maximum nutritional level, but when it is most easily harvested, stored and transported, with more chemicals added post-harvest to prolong shelf-life or prevent subsequent pest attack.

"There are enormous opportunities to re-design systems to produce nourishing food, starting with growing crops where they grow best and selecting varieties on the basis of the nutritional value of the produce.

"Strongly growing crops are less attractive and less susceptible to attack by pests, so choice of the right site will diminish the risk of pest damage, particularly if the site provides minimal habitat for pests and maximum habitat for the natural control agents."

The type and level of change needed to develop sustainable systems of food production will occur only when growers start to be paid fairly for their work, either by government or by consumers, Professor Hill said.

"In a natural ecological system over 90 per cent of the available resources goes into maintenance of the system. Nature is not big on productivity; the focus is on system-maintenance, which is what genuine sustainability is about. But in modern agriculture the only reward is for production, which is an incentive to neglect and over-tax the system.

"There is no provision in the commercial structure for maintenance of natural systems, and that needs to change before we can start to think seriously about sustainability.

"Producers have to be rewarded for maintaining the natural systems if those systems are to continue operating for future generations.

"What that means, in a market-driven commercial system, is that the price of food needs to rise sufficiently to give growers a level of income which will allow them to take care of the natural systems on which their production depends. There is also a case to be made for payments to be made on the basis of their basic resource management.

"If we rewarded producers for maintenance of the environment they manage they would be able to build up the natural capital in the system, and the system would paradoxically become more productive and sustainable."

Ecological economists distinguish between natural capital, manufactured capital, human capital and economic capital, he said. In the conventional system, natural capital is often an after-thought or completely ignored, despite the fact that natural capital is the foundation for all the other forms of capital

"Without the natural capital the system breaks down, so we need to re-design what we are doing to sustain and preserve the natural systems on which we depend.

"Paying producers to maintain the environment and the natural systems on which they rely, whether through higher food prices or through the government purse, would be a national investment in natural capital, an investment in which the benefits over time would far exceed the costs.

"It is smart to build natural capital."

While there continues to be a focus on cheap food, surveys indicate that some consumers at least are prepared to pay more for food which they identify as good for them and the environment, which is a step towards paying for maintenance of the system, Professor Hill said.
But it is important that organic food not be priced out of the reach of ordinary consumers, as is the case in France where mark-up for organic produce is so high it is accessible only to upper middle-class consumers.

For his part he tries to buy direct from producers, which allows him to access the food at a reasonable price, while the grower gets more than he or she would by selling through a wholesaler or agent.

"I recognise that middle-men providing marketing services deserve payment for providing those services, but if you cut out the middle man the consumer pays less and the producer gets more; hopefully enough to pay for maintenance of the natural system he is relying on."

Professor Hill is working with others to develop a 'farm trail' in the Hawksbury area, with a map showing the locations of producers willing to sell direct to consumers. The trail will also include craft outlets, historic sites and accommodation venues as added incentives to consumers to take the trip, he said, but the primary objective is to put consumers in direct contact with producers of healthy fresh food, including organic and biodynamic produce.

MANY BENEFITS FROM ORGANIC MATTER

There is every indication that organic matter would have a significant role in any production system designed by Professor Hill, who culled the following list of the environmental 'services' and other benefits provided by soil organic matter from the resources of the Ecological Agriculture Projects resource centre.

The benefits of organic inputs, such as that provided by green manuring, include the often over-looked benefits of the soil being easier to work, so there is less wear and tear on tillage equipment and less fuel required to pull it.

The full list of benefits looks something like this:

Earlier and easier cultivation, using less energy.

Better soil structure enabling improved root penetration, improved water-holding capacity, improved drainage and aeration and increased resistance to compaction and wind and water erosion.

Higher soil temperatures, because the soil is darker and has more biological activity

Soil with optimal levels of organic matter provides plants with a balanced supply of major and trace elements, releases nutrients as plants need them, buffers toxins such as excess nutrients, heavy metals, organic poisons and pH imbalance, and stores nutrients in releasable but unleachable forms.

Enhanced biological activity, sustained by the organic matter, results in greater production of beneficial substances such as plant hormones, natural antibiotics, microbial gums and filaments, carbon dioxide and heat. This also results in more nitrogen being fixed and provides greater density and variety of natural control organisms.

High levels of soil organic matter also reduce contamination of the environment with agricultural pollutants and lowers dependence on non-renewable resources, so the system is more self-reliant and sustainable.

That complex of benefits is simply not available from chemical inputs.

FLAWS A CAUSE FOR OPTIMISM

Professor Hill takes perverse comfort from the problems facing Australians, and the worlds, production systems.

"I am optimistic about the future because there are so many possibilities.

"There is room for huge improvement because we are doing so many things wrong.

"We haven't even scratched the surface."

One of his many diverse areas of interest is change management -- how to bring about change - and he believes the key is to start small with achievable goals.

"Once you get into huge, undoable, Olympian tasks people go off half-cocked, hit a barrier, get discouraged and achieve nothing.

"When I'm working with producers I aim for the smallest meaningful initiative the person can guarantee to carry through to fruition, even if it is only phoning someone to talk through an issue, which gets them into the habit of doing things.

"In parallel with that, people need to learn to celebrate their small initiatives and achievements, as this starts to make them contagious."

A ROLE FOR INTUITION

While Professor Hill is first and foremost a scientist, a combination of personal experiences and his training in psychotherapy have combined to develop in him a healthy appreciation of the importance of intuitive perceptions.

"A purely scientific approach does not allow for the intuitive understanding of the ‘good’ farmer; or fisherman, for that matter.

"Most people, including scientists, make decisions partly based on ‘feelings’ and intuitions, probably more often than they recognise, but science makes no allowance for that.

"In fact, most aspects of science are in denial about the phenomenon, and scientists set-up experiments which ignore it."

Those feelings or intuitions are, in fact, based on readings of inputs we don’t consciously recognise, Professor Hill said; and while most tertiary courses provided no support training for use of those intuitive registers, and in many instances actively worked against them, several Hawkesbury courses are designed to help heighten students’ awareness of those registers and the validity of them.

"In social ecology we talk about mystical or spiritual dimensions, which are not scientific but represent our best attempts to acknowledge that conscious human knowledge represents only a minute portion of the sum of knowledge in the world."

He illustrates that concept by reference to a graphic image, used by André Voisin, a French agronomist, to make the same point, in which a minute dot beside a huge circle represents the sum total of human knowledge with the circle representing the knowledge there is to discover; and a similar, but more ‘elegant’ image from a German philosopher, Ludwig Liechtenstein, who described it "as if we set out to spell and find each letter is in turn a word".

"There is no doubt we need to get better at recognising and making use of these intuitive inputs. I have found that most producers are quite comfortable working with them," Professor Hill said.

To reinforce the point he tells the story of his grandfather, an ‘uneducated man’, who knew intuitively just when and where to plant particular vegetable crops.

"He couldn’t explain it. He just knew the time was right and that is what he should do.

"Although the reasons may have been inexplicable, but the inputs he was tapping into were still real, and the results he achieved with his intuition out-stripped those of people taking the more limited ‘scientific’ approach."

Professor Hill observed a similar phenomenon when scientists were trying to provide UK fishermen with science-based decision-making tools -- climatic data, currents, water temperature, moon phases and so on -- designed to improve catches and operational efficiency.

Whereas the new ‘tools’ improved the performance of less capable operators, they were still out-fished by the best fishermen, who continued to work intuitively.

"It's the same with really good farmers, although the modern trend to put farmers through degree programs strongly focused on conventional science is tending to kill that by closing them off to intuitive inputs, which are real even thought they can't be easily measured."

SECRET SCIENCE OF BIODYNAMICS

Professor Hill is one of the few people who have conducted formal research into the mechanics of biodynamics.

"Biodynamics tends to be presented with a high level of mythology and talk of etheric forces and so on, but if you analyse the preparations you find they are in fact, if properly made, highly concentrated inoculums containing high levels of trace elements and a variety of micro-organisms."

The starting point for the preparations - he worked with the compost preps when he did the research some years ago - are the flowers of several plants which Rudolf Steiner specified should be picked on the first day the flowers opened, he said.

Each of the specified flowers has different characteristics that make them ideal substrates for specific groups of micro-organisms, he said. Picking them on the day they opened ensures that they contained the most concentrated levels of trace minerals.

"Different flowering plants use different trace minerals as catalysts in the production of odours to attractant insects for their successful pollination.

"The plant pumps the minerals, which can be in short supply in some environments, up into the flower on the day it opens to maximise its attraction to pollinators while the receptors are fresh. It then recycles them by translocating them to the next flower that opens and so on, repeatedly re-using the minerals to the plant's maximum benefit.

"So picking fresh flowers ensures maximum trace mineral content in the preparations."

When the mixtures of flowers and other components are buried, as prescribed by Steiner, they are colonised by micro-organisms from the surrounding soil and the microbes continue to multiply and build up on the substrate provided by the flowers until the material is broken down. At this stage they produce spores, so the preparations dug out of the ground are concentrated inoculants of trace minerals and spores of a range of micro-organisms: everything needed to trigger a high level of biological activity in the compost or soil, depending on the particular preparation.

"There are undoubtedly other factors or forces at work, but that is at least part of the scientific explanation for that element of the process."

He believes the challenge for committed Australian BD practitioners is to find indigenous plants that can be substituted for those specified by Steiner in Europe.

"There is nothing magical about the plants Steiner chose; they are just what he was familiar with, in the environment in which he was working.

"If he’d been in Australia he would have used Australian plants and I am confident there are indigenous plants which would do the same job as the European species."