Permaculture in Architectural Education: An Educational Tool and a Strategy for Urban Agriculture

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INTRODUCTION

Many assumptions guide the landscaping of cities. One of these assumptions is that edible landscapes have no place in our cities. Trees should not bear fruit, groundcovers should not be edible, and shrubs should not be vegetables. Useful plants are ugly; grass and ornamental plants are beautiful. Moreover, being beautiful is the finite role of city landscapes, with similarly bounded roles delegated to country, suburban and wilderness areas.

Seemingly disconnected from this, is a global environmental crisis of which a significant part is due to society's current agricultural practices. The environmental problems caused by these practices fall into two distinct areas.

Firstly, there are those relating to the deterioration of agricultural land and wilderness areas. Rivers and forested areas are dying due to pesticide contamination; topsoil is permanently lost through deforestation and erosion; and salinisation renders irrigated land unusable.

Secondly, modern agriculture expends massive amounts of energy. The monocultures used in modern agriculture require energy expenditure every year for turning the earth, controlling weed competition, inhibiting pests and disease, fertilising the earth and harvesting. The land is exploited in a way that demands external energy resources that come from fossil fuels as part of an industrial system.

Through most of this damage occurs in rural areas, it is *caused* by urban consumption. As well as the environmental issues of running monocultural farms, there are the issues of: transporting products to the city; packaging and processing them for sale; losses due to handling and storage; and finally dealing with the resultant waste. At present, cities are energy sinks because of their separation from all those resources that they need to exist, such as food to stock the supermarkets, restaurants and fast food outlets that feed billions of people. And cities are extremely vulnerable because of their dependence on these resources.

Yet, despite all the environmental degradation that occurs for the sake of food production for urban dwellers, we continue to design useless landscapes in our cities. Architects, as decision-makers shaping the nature of our urban space, are well placed to address this issue.

However, my architectural education of three years has done little to equip me for solving any of these current environmental problems. Environmental design is covered, but, like most other segments of my education, has been compartmentalised into a 'subject' that is not given enough relevance in any other 'subject'. Even within this environmental curriculum, landscape issues are sadly remiss. The landscape that houses the architecture that we learn to design becomes little more than a design tool to manipulate and exploit for the sake of 'architecture'.

The aim of my honours thesis was to investigate a means by which architectural education could encourage the development of useful and sustainable urban landscapes. I hoped to achieve this by designing a permaculture for the architecture department at the University of Queensland, Australia that would supposedly do two things. Firstly, it would act as an example of a useful, sustainable urban landscape. Secondly, it would demonstrate the possibilities of permaculture as a tool in the transformation of architectural education. The educational transformations I refer to are proposed by Leslie Weisman and stem from the previous part of my thesis where I discover an affinity between her principles and permaculture values.

So what is permaculture?

The best way I can describe it is through a comparison.

TWO WAYS TO PRODUCE AN EGG.

The first is the way we do it at the moment. It has evolved in a way so that people, machines, time and energy are expended in vast quantities with the aim of maximum product yield regardless of the environmental costs. The second is the way proposed by permaculture. This system short cuts all that energy wastage with gains in personal and global health and with a far greater variety of yields available for *local* ecologies. We get the egg, we get to eat what the chicken eats, we get to eat the chicken. We can use its feathers, we can use its scratching and foraging behaviour to control pests and when it poos, it fertilises the garden for us.

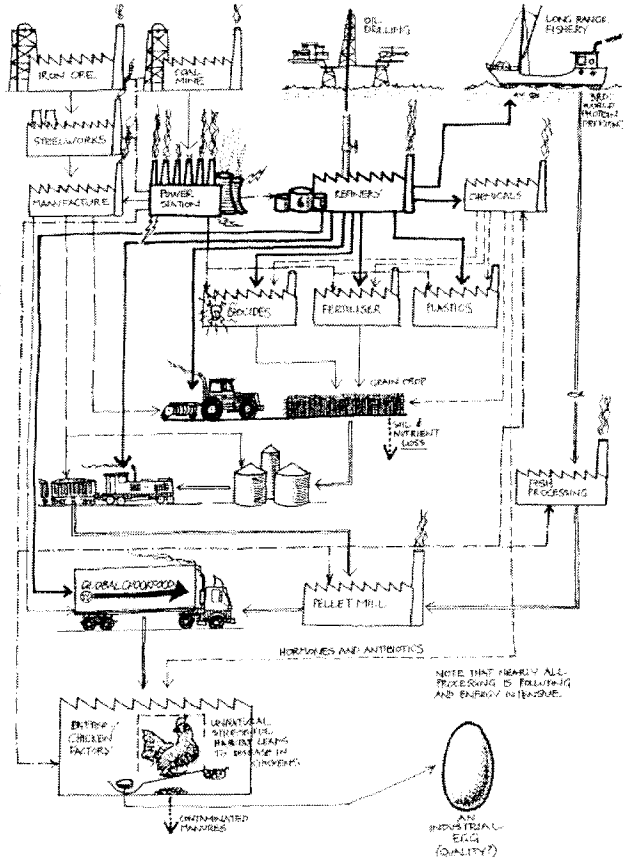

Fig. 1. An egg from our current agricultural system (used with permission by Tagari Publications, NSW, Australia)

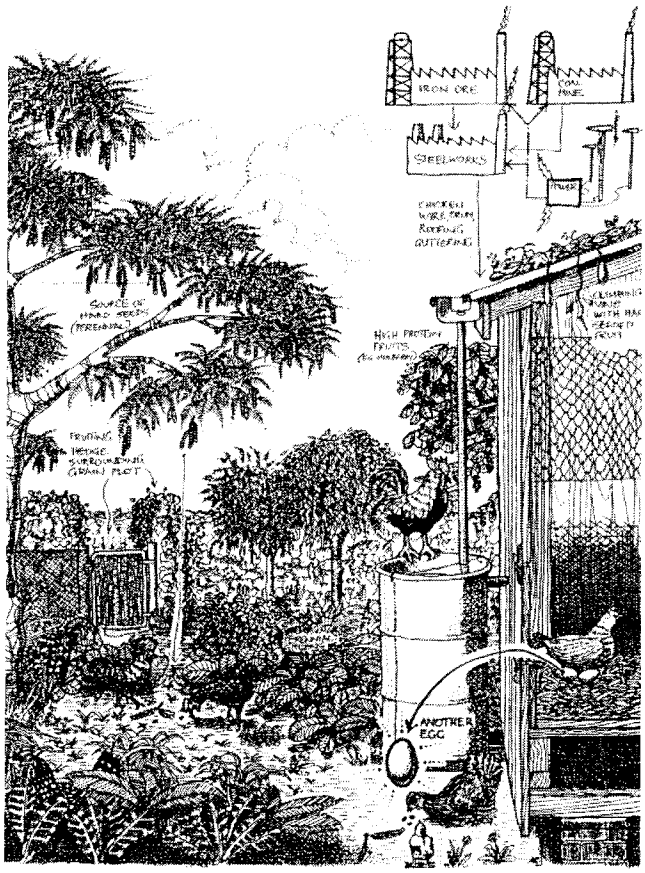

Fig. 2. An egg from a permaculture system (used with permission by Tagari Publications, NSW, Australia)

Bill Mollison, who co-founded permaculture with David Holmgren, summarises the philosophy of permaculture as this:

> "One of working with, rather than against nature; of protracted and thoughtful observation rather than protracted and thoughtless action; of looking at systems in all their functions, rather than asking only one yield of them; and of allowing systems to demonstrate their own evolutions." (2)

Permaculture as a design system, contains few new elements. It takes what is already there, human-controlled, energy-demanding, artificially-designed landscapes, and arranges them so that they work to conserve energy or to generate more energy than they consume. The spatial arrangement of all species and structures in a permaculture is a design problem. Once the system is *designed* to support itself, our time is taken up by gathering up all the various yields that are produced.

Now, while permaculture offers a very strong theoretical framework from which to address sustainability, it is yet to infiltrate non-residential, urban areas where permaculture's implementation is pertinent to its cause because cities must and can start producing more food. The philosophy has been extended and explored in farms in developed and developing countries across the globe, yet in cities, most of its exploration has been limited to backyards and community gardens. The *need* for permaculture to become part of an urban environment is established, but a *strategy* to implement this goal has not been devised.

One way I think that this goal could be realised is by making permaculture a relevant design tool for architects. If permaculture could be used as an urban landscaping tool in architectural education, its applications to the city could be developed and later integrated into architectural practice.

Besides permaculture helping architects develop a more effective and holistic attitude to urban landscapes, the use of permaculture as a design tool could also begin to transform education.

So back to my design.

The University of Queensland is one site in Brisbane that could most easily be producing its own food, providing for more of its own energy needs and creating a more congenial environment in which to share knowledge. There is a myriad of grassed areas, unoccupied or unutilised balconies, rooftops, northern walls and water bodies for such a purpose. I decided to do a permaculture design for a well-known site at my Department- the new workshop.

I identified several problems with the collaborative workshop site.

Firstly, a white surface for the deck on top of the workshop

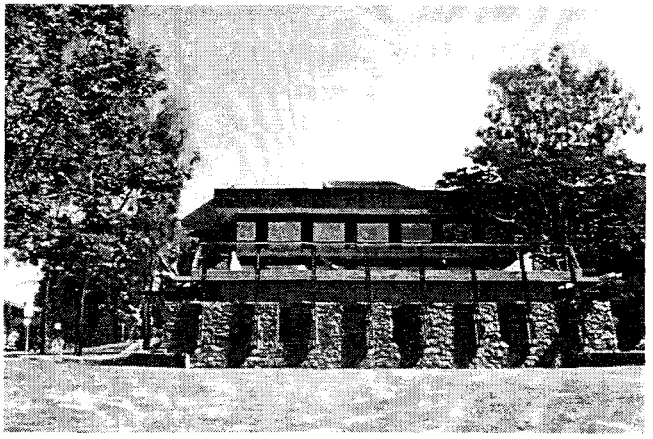

Fig. 3. View of the Collaborative Workshop, University of Queensland.

may have been chosen for various reasons, but the effect? A deck that is so glary, it is almost unusable on a sunny day. Secondly, the lawn in front of the building is one of the University's most prevalent monocultures. Lawns are an energy expensive, labour intensive method of covering space. To maintain it, the grass is fertilised artificially and then hacked back as it tries to grow. Sometimes we even poison it so nothing else can enjoy its presence. Thirdly, due to the University's fetish with lawns, local bird life is deprived of their natural habitat and forage and as a result, their diets need to be supplemented. Because the lake's edges are mown, pollutants readily enter the aquatic system. Finally, there is no free food to be gathered at lunch. The landscaping around the building provides no use other than its aesthetic value. The vines will bear no fruit; the low-level shrubbery will provide no shade.

I won't take you through all the steps in my process of design. But what I ended up with were various zones (see fig. 4) that make the most of the destructive and beneficial energies that move through the site (see fig. 5). The "Intensive Vegetable Production Area" receives full sun in the morning (the best growing sun) and makes use of an otherwise unused roof deck. The "Native Grasslands" receives the sun it requires; creates a wide ecotone that can absorb nutrient runoff so it doesn't pollute the lake; is a habitat and forage for wildlife; and won't block northeast breezes to the site. The "Deciduous Trees" provide shade for the building in summer while allowing sunlight to enter in the winter; receive full sun throughout the morning; and absorb runoff. The "Bush Food Area" is a habitat and forage for wildlife; and is a shelter from harsh winds and direct sunlight. The "Deciduous and Evergreen Food Forest" and the "Trees Interplanted with Cars", catch water run-off; shade the road thereby reducing glare and radiate heat; mediate the air around the building; provide food for wildlife; buffer the site from winter winds and cars; and do not cast shade on the intensive growing areas.

I don't need to design for chickens, a key component of most permaculture designs, because there is so much birdlife already existing. Wildlife is attracted to the habitat and forage provided by the whole system, thereby becoming an integral part of the system. Birds and other small mammals provide fertiliser through manure and pest control through their forage. And each of these zones provides free, organic food.

The permaculture design of the site was done in three stages: initial, intermediate and evolved, to demonstrate the successive design of the site. The system is designed with tree, shrub, groundcover, vine and vegetable crops for short, medium and long-term benefits.

In a conventional monocultural practice, such as a vegetable or grain field or an apple orchard, the system is kept from developing towards a stable state. To set a system back and stop it evolving in this way, energy must be used to keep the crop cut or pruned, weeded, tilled, fertilised and sometimes burnt. In a permaculture system, instead of fighting the processes of evolution, they are encouraged and even accelerated. Unlike the processes of nature, however, the elements of such a succession can be planted all at once, so that the pioneers, groundcovers, under-storey species, tree legumes, herbage crop, mulch species, the long-term windbreak and the tree crop are all set out at once. Mulch is produced on site for the long-term crop, while weed competition and wind damage, are nullified or moderated.

In the initial stage, non-productive trees are removed and used for mulching the site. This negates the need to bring in a similar mulch from elsewhere and creates more space for the planting of productive species. Garden boxes can be constructed for the roof deck and filled using a potting mixture and sand and composted bark chips from the site. After this mixture is made, seedlings can be planted immediately and be producing after only a few weeks.

In between the trees planted on the site are perennial and annual vegetables and herbs that will be beneficial to the tree crop but will also produce food for humans and forage for wildlife (see fig. 6). Cropping can be continuous as the annuals and herbaceous perennials effectively control unwanted grasses and weed species. For instance, radishes and turnips planted with tree seedlings control grasses until the small tree provides its own grass control by shading. So instead of waiting two to twenty years for a tree crop, the site can give vegetable, herb and root yields after maybe three months.

The Native Grassland is implemented by sowing seeds directly into the existing grass and then leaving the area unmown for six months. After this, strategic mowing to coincide with the predominant grasses' flowering will diversify the community.

Then, as the trees mature, some of the full sun dependent understorey that was productive in the first five years will be shaded out and the site will be crowded with young trees (see fig. 7). They will give a high diversity of yields including coppice, nuts, bark and fruit. After ten years, the system will produce its own mulch and fertilisers while also providing forage for larger animals, and will produce large amounts of a less diverse tree crop. Many of the understorey trees that are short-lived or less tolerant of shade will have died off and the

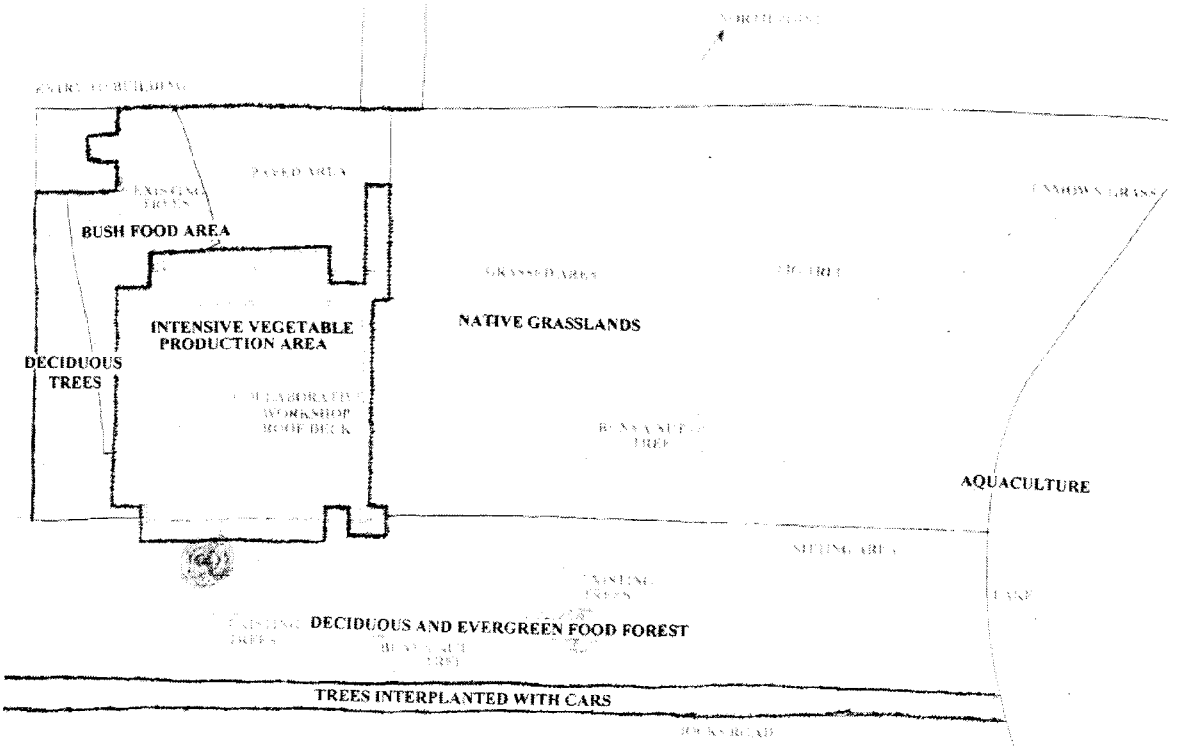

Fig. 4. Plan of zones that will deal with the energies entering the site

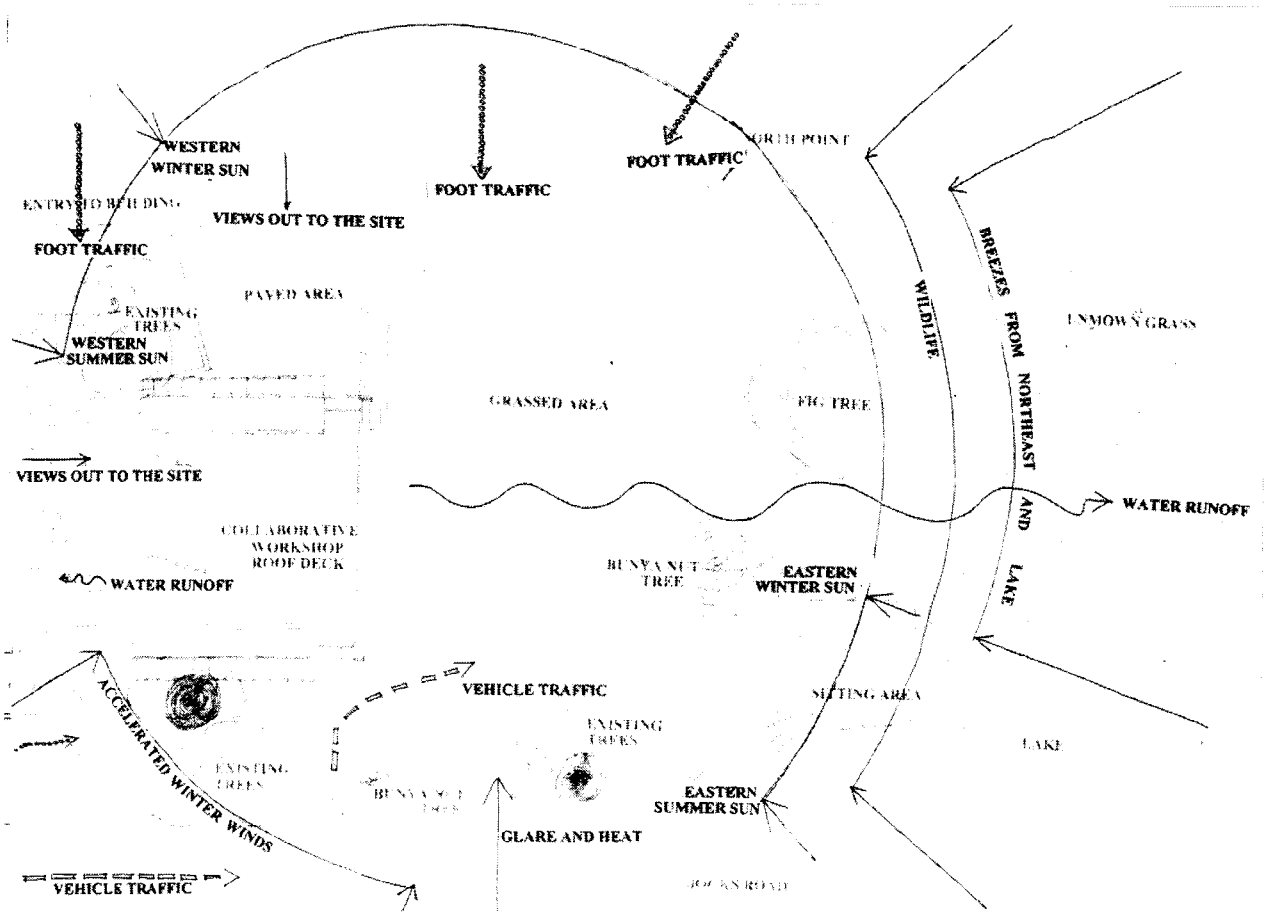

Fig. 5. Plan of energies entering the site

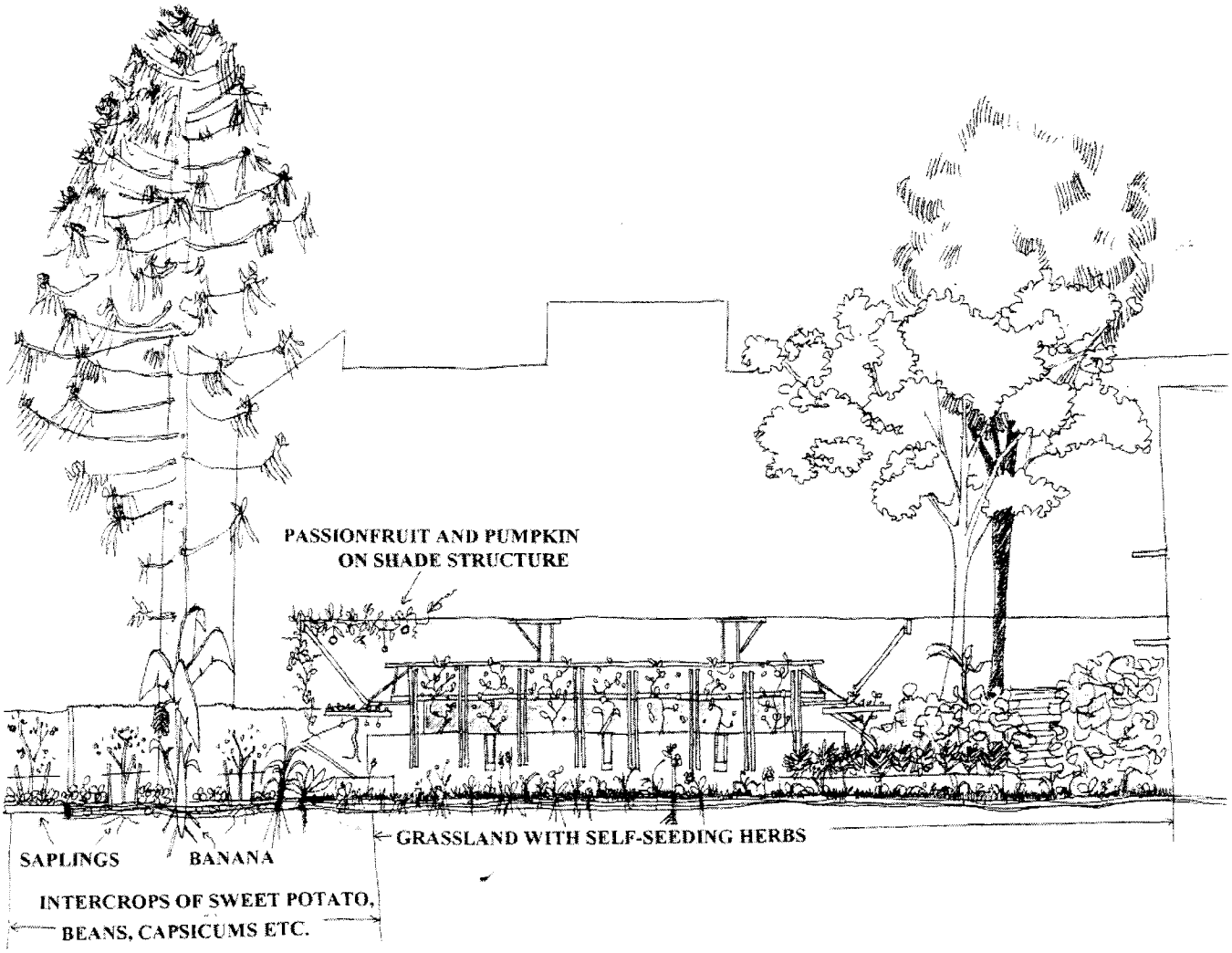

Fig. 6. Section of design after one year

rest will become a specialised, hardy crop for animal and human forage.

So how did I do? At least, I think my design gives some insight into the possibilities of permaculture as a design tool. However, it is unlikely that I have considered all the factors that will effect the ability for this design to be self-sustaining, nor is it evident how my permaculture design could be a tool in transforming education. Despite the fact that these two outcomes are crucial to the aim of my thesis, my design process has hampered their achievement.

So what's the problem? The methodology I used to create a permaculture design for the Collaborative Workshop has not allowed me to truly explore the goals of sustainability and educational transformation stated in the 'brief'. I have designed in a manner that stems from three years of architecture design education. Though my methodology has served me well within the bounds of the course, permaculture design has challenged my training by changing the parameters of what defines a successful design. In this sense, my design is as much an example of the limitations of the current educational methods, as it is an example of the possibilities of a permaculture for the Architecture Department.

To exemplify this, I will look at four problems that I encountered in my design methodology and examine how they could have been improved if Weisman's principles of education had been implemented.

EMPLOYING COLLABORATIVE LEARNING

I don't think its possible for one individual to design a self-sustaining system, like permaculture, because the scope and comprehensiveness of the outcome will always be limited. The purpose of a functional and self-regulating design is to place elements of components in such a way that each serves the needs and accepts the products of other elements. To return to the chicken (see Fig. 2): she is just one component in a system that contains hundreds of components. To understand the relationships that exist between the chicken and all the other components in a system requires an expansive knowledge base. My own knowledge base plus the information that I can attain from books, the internet and other

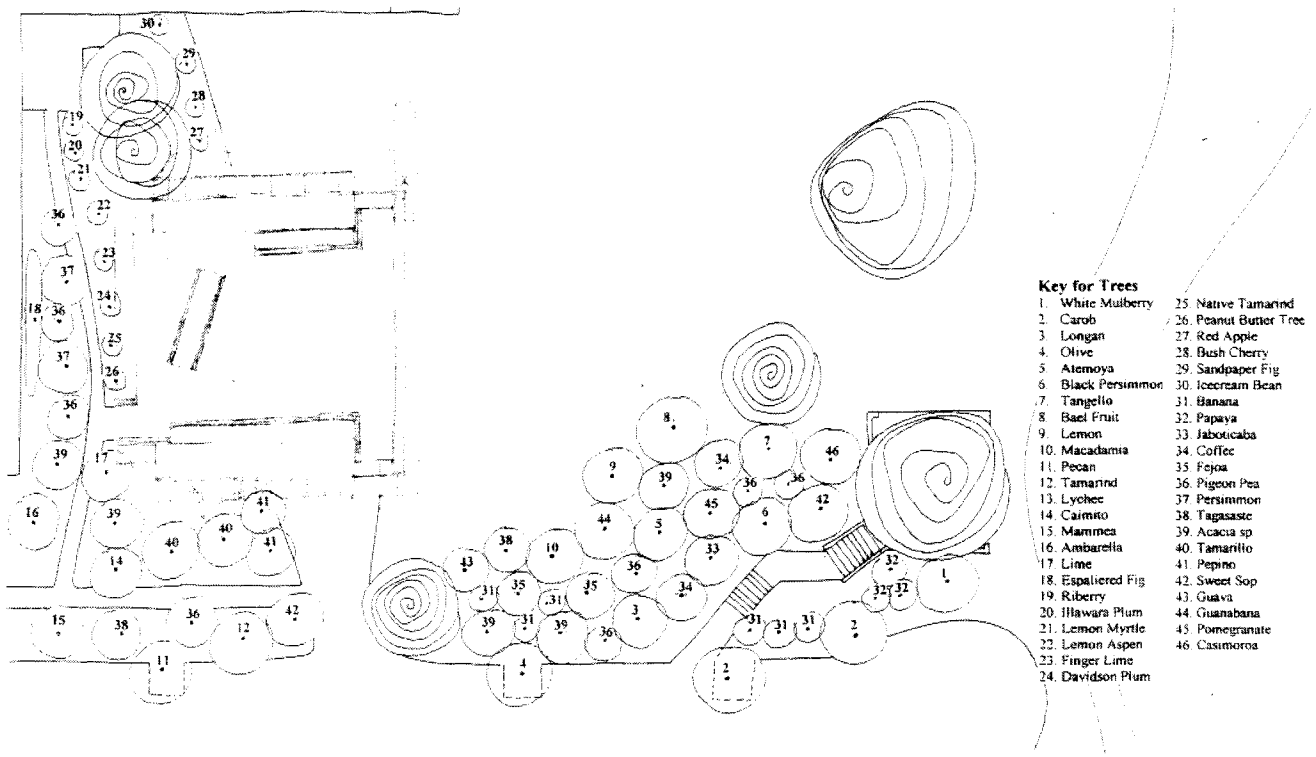

Fig. 7. Plan of intermediate design

examples of permacultures, is still an infinitely small portion of the knowledge that is actually available.

If, however, collaborative learning were employed, students and educators from different disciplines could be involved in design problems. In this way, the knowledge available for the design has the ability to be as broad as the entire University's knowledge base. For example, soil testing, an important step in ascertaining the stages of implementation of a permaculture design, could be done by agricultural students. They could analyse the soil, and help decide what strategies could be used to compensate for the soil's deficiencies.

Such a learning process: allows a more extensive knowledge base to be achieved; provides a space for more lateral problem-solving techniques; and would allow design to occur at a more intricate scale within normal time restraints. Therefore Leslie Weisman's first principle, "Employ Collaborative Learning" (3), would ensure that a permaculture designed by students was in fact sustainable.

SHARING AUTHORITY AND KNOWLEDGE

Due to the fact that permaculture involves new design processes and knowledge resources, it is not possible for educators to teach permaculture in the same way that architectural design is taught. My methodology and presentation of this permaculture design encourages the assumption that I am the knowledge carrier- the solo-virtuoso designer, yet, my supposedly "resolved" design is ill-equipped to challenge interdepartmental relationships, nor does it extend the interest or inspiration for permaculture design past its present status.

If the second principle that Weisman proposes, "Share Authority and Knowledge" (p.281), were advocated in such a design project, it is possible that educators as well as teams of students could be involved in the design process. Many lecturers would be as naïve, if not more unknowledgeable than many of the students about the process. Educators would have to relinquish their grasp over knowledge to become involved in the learning process, thus acknowledging the importance of the project and encouraging cooperation and equal positions rather than competition and authoritative positions. Thus Weisman's second principle, "Share Authority and Knowledge", ensures that permaculture is received as a truly relevant tool in architecture design that isn't undermined by the previous attitudes of students and educators, and can be remembered as more than a 'brief' that loses significance after a project's completion.

Both of these axioms, "Employ Collaborative Learning" and "Share Authority and Knowledge", also allow the permaculture garden to emerge from a process that our community has developed and sanctioned, rather than had imposed upon them. At least, this helps ensure that a group of people is committed to keeping the garden running.

ELIMINATING FALSE DICHOTOMIES

Permaculture design is a process that cannot be understood as finite drawings. It is a design of concepts and strategies that span time as well as 'garden design'. Judgement of its success depends on more issues than form, function, aesthetics and structure. In the way that my design has been presented, its success can only be measured against relevant theory. Less objective evaluations, such as its ability to survive a harsh summer, or how many people use it, will depend on the design being implemented.

So, to help eliminate the assumption that: the best way to learn about the practice of design is to start by designing in theory; the assessment of such a permaculture design project would depend on its real success, not only as a sustainable system but also as a system that contributes to a more inclusive society. Through its implementation, the design project can become an immediate visual demonstration as well as a permanent example of an urban permaculture that can be continually referred to. Thus Weisman's third principle "Eliminate False Dichotomies" (p.281-2), would contribute to permaculture's environmental and social relevance in the urban environment.

EMPHASISING ETHICAL VALUES AND INTERCONNECTEDNESS

Permaculture is the design of the connections between components so that they can sustain each other. The exact nature of the connections and the systems purpose in the wider realm of sustainability is left open to ethical argument. In my permaculture design, I made certain decisions that may conflict with other views within the department. For example, I chose to remove existing native, less productive trees and plant non-native, more productive species in their place. I chose to hide the workshop on the southern side behind a food forest, thus detracting from its modern, monolithic aesthetic status. I chose to replace the grass in front of the workshop with a grassland that is not as human-orientated.

At the moment, the Department does not conduct many debates on possibly controversial decisions such as these. However, if this project were collaborative, I would not be able to make decisions that were only acceptable to me. Decisions would need to be agreed upon which means that discussions about strategies, such as the ones I chose would allow more broad ethical values to be investigated by everyone involved.

These discussions could lead to a number of outcomes. Students could begin to discuss what their decisions could mean on a larger scale. For example, if unproductive trees are cut down on site to provide nutrients and mulch, then old growth timber is less likely to be cut down for that purpose. Such discussions provide a link for students between their permaculture design and larger issues to do with the University campus, the catchment and the city as an ecosystem. With the acknowledgement of this interconnectedness could come an identification of architecture's own ethical inadequacies; a recognition that current architectural and agricultural practices need to be changed; and subsequently the questioning of long held aesthetic assumptions about urban landscapes like those that introduced this seminar.

So, by emphasising the ethical implications of a permaculture design project and the importance of interconnectedness as a permaculture design objective, students can begin to formulate their own value systems that will withstand time and fashion. In this way, the fourth principle, "Emphasise Ethical Values and Interconnectedness" (p.282-4), ensures that permaculture's importance extends beyond its use as a student design problem, to one that the entire profession would, I believe, come to understand as crucial to sustainable urban design.

CONCLUSION

have separated these principles into four sections to illuminate their individual possibilities. Yet, this segregation is misleading because each principle relies on the others for its existence. The recognition of a need for ethical values develops a common bond of resistance and it is this force which counters authority. In doing so, the second principle, "Share Authority and Knowledge", is evoked. Whereas the last principle, which stresses the importance of acknowledging "interconnectedness", has no basis if individual, competitive creativity were still favoured over collaborative learning. Moreover, collaborative learning would not be possible if the nature of success were not challenged by eliminating the dichotomy of theory and practice.

As these four examples illustrate, many of architectural education's current inadequacies can be deconstructed through permaculture discourse. Permaculture's focus is on our landscape and consumption, but as a model for architectural education, permaculture could change the way architecture students learn.

NOTES

1. Leslie Kanes Weisman, "Diversity by Design: Feminist Reflections on the Future of Architectural Education and Practice," in *The Sex of Architecture*, ed. D. Agrest, P. Conway and L. Weisman (1996): 280-284. New York: Harry N. Abrams
2. Bill Mollison, *Permaculture: A Designers' Manual* (5th Ed. Tyalgum, NSW: Tagari Publications, 1996), ix.
3. Weisman, "Diversity by Design: Feminist Reflections on the Future of Architectural Education and Practice," 280.

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