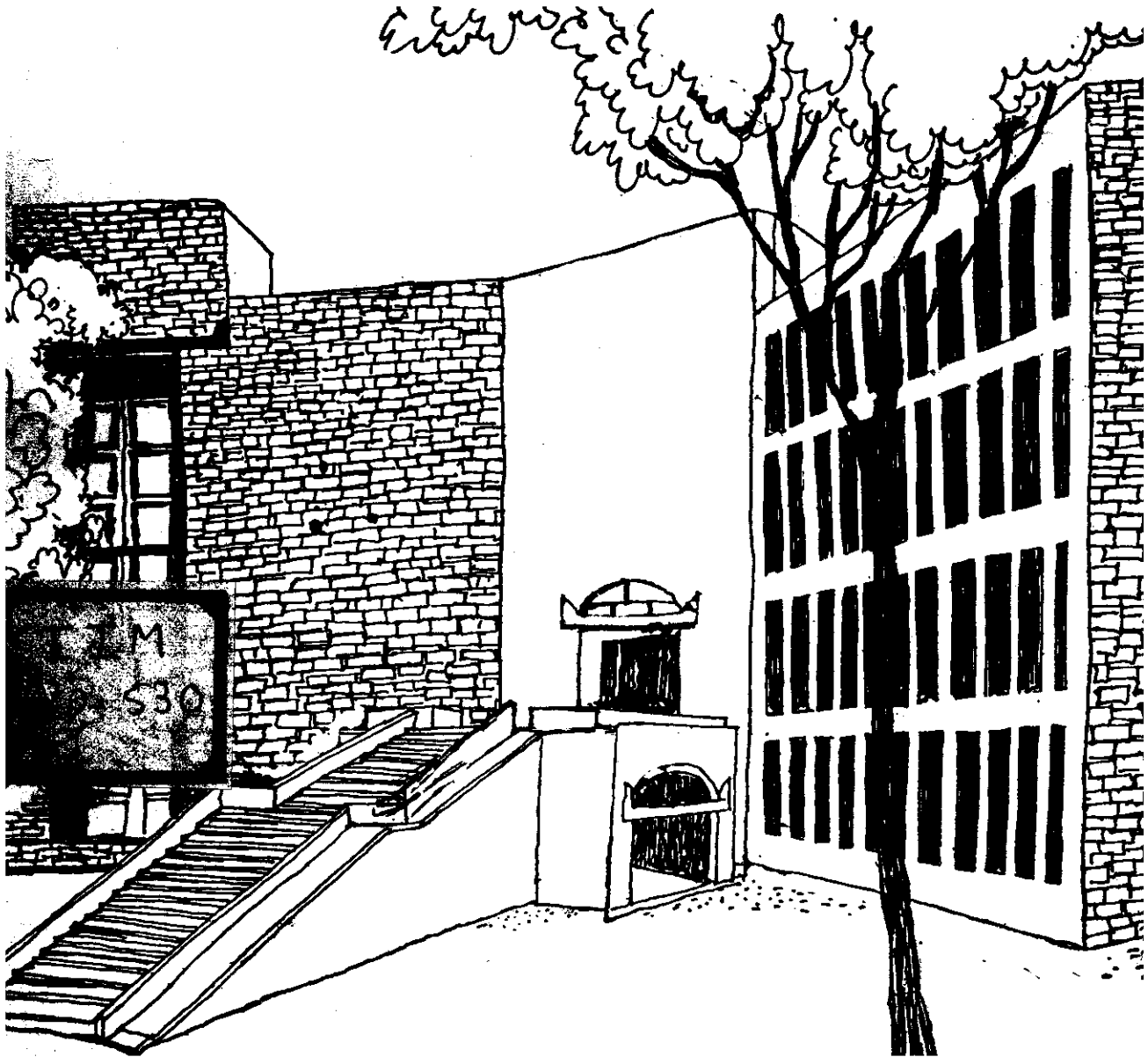




Working Paper



URBAN AGRICULTURE: URBAN PLANNING
AND THE AHMEDABAD EXPERIENCE

By

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Urban Agriculture, Urban Planning and the Ahmedabad Experience

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Abstract

Cities all over the world are growing rapidly and the manifestations of the Urban Crisis in a variety of areas, viz., environment, food, health, energy, landuse, are quite evident. Urban landuse patterns are changing dramatically due to the pressure of population and the role of agriculture in supplying food, fuel, forage and forest products has declined considerably. The urban poor's access to food has become worse and they have to pay higher prices for food and fuelwood, while their incomes are growing more slowly. The food subsidies and public distribution systems for essential commodities defuse and contain the crisis in the short term but do not address the needs of the poor in the long term. This paper looks at the experience of Ahmedabad, an Indian city and the historical transition of urban food system and develops alternatives for urban planning that focus on urban agriculture.

The current urban development programmes systematically ignore the basic needs of the urban poor and their social ecology. They largely concentrate on creating physical structures (roads, housing, water supply, sewage disposal etc.) involving new investment, benefitting some areas and some groups. The possibilities of utilising existing urban physical resources (land, water, idle production capacity, wastes) and social resources (state, market, household and collective nonmarket community institutions) more effectively to produce and distribute the basic needs of food and energy, are very promising. Urban agriculture can increase food self-reliance and security in cities, be environmentally sustainable and increase the democratic control of the urban poor in meeting their

basic needs. There is very little understanding of this issue among decision makers, professionals and citizens. Historical experience and current practice in Indian cities (and elsewhere in Asia) show that it is possible for them to produce as high as 60 per cent of their basic food needs. There are several social, political and economic constraints, however, in promoting urban agriculture. This paper will discuss the planning issues involved in urban agriculture in India, review the specific case studies and experiments in Ahmedabad, based on an ongoing study, and generate public policy options for urban agriculture.

1.0 INTRODUCTION

Cities all over the world are growing rapidly and the manifestations of the Urban Crisis in a variety of areas, viz., environment, food, health, energy, landuse, are quite evident. Urban landuse patterns are changing dramatically due to the pressure of population and the role of agriculture in supplying food, fuel, forage and forest products has declined considerably. The urban poor's access to food has become worse and they have to pay higher prices for food fuelwood, while their incomes are growing more slowly. The food subsidies and public distribution systems for essential commodities defuse and contain the crisis in the short term but do not address the needs of the poor in the long term. This paper looks at the experience of Ahmedabad, an Indian city and the historical transition of urban food system and develops alternatives for urban planning that focus on urban agriculture.

The current urban development programmes systematically ignore the basic needs of the urban poor and their social ecology. They largely concentrate on creating physical structures (roads, housing, water supply, sewage disposal etc.) involving new investment, benefiting some areas and some groups. The possibilities of utilising existing urban physical resources (land, water, idle production capacity, wastes) and social resources (state, market, households and collective, nonmarket community institutions) more effectively to produce and distribute the basic needs of food and energy, are very promising. Urban agriculture can increase food self reliance and security in cities, be environmentally sustainable and increase the democratic control of the urban poor in meeting their basic needs. There is very little understanding of this issue among decision makers, professionals and citizens. Historical experience and current practice in Indian cities (and elsewhere in Asia) show that it is possible for them to produce as high as 60 per cent of their basic food needs. There are several social, political and economic The author acknowledges specially the findings of a forthcoming study on urban gardens in Ahmedabad by Sugandha Ganapathy which have been very helpful in the preparation of this paper.

constraints, however, in promoting urban agriculture. This paper will discuss the planning issues involved in urban agriculture in India, review the specific case studies and experiments in Ahmedabad, based on an ongoing study and generate public policy options for urban agriculture.

2.0 THE NATURE OF URBAN AGRICULTURE

Presently, urban agriculture is on the decline in cities as the pressure for land and scarcity of water have become acute problems. In the urban land market, agriculture represents probably the least remunerative use. However, market may not always be the right place to determine the longterm value of agriculture. The experience of cities that have significant urban agriculture, has been positive, though they may not be justifiable by conventional economic analysis. Here, we are using the term urban agriculture to include formal cultivation of crops, fruits and vegetables, forestry, parks, gardens, orchards, animal husbandry, fuelwood plantation, aquaculture and related activities. Such a broad definition of urban agriculture is necessary because many of these activities are complementary and cannot be looked at, in isolation. Given the shortage of land, the need for integrated planning of multiple use space is obvious.

Let us presently look at some of the benefits of urban agriculture:

- i) Improvement of food supply (vegetables, fruits, milk, poultry, fish etc.) in a city from local sources, thus increasing reliability of supply at lower transportation costs;
- ii) Meeting the local needs for animal fodder;
- iii) Moderation of the climate through trees and vegetation by decrease of temperature and increase of humidity;
- iv) Purification of air through oxygenation of trees and dilution of polluted air with fresh air;
- v) Protection of soil through prevention of soil erosion and run off;

- vi) Improvement of ground water supply through retention of soil moisture and recharging;
- vii) Entrapment of dust particles to prevent sand storms and soil instability;
- viii) Reduction of noise pollution by absorption, deflection and masking of sounds.

Many of these benefits are highly tangible and have long term economic benefits. However, as conventional economic analysis considers many of these benefits as 'externalities', investment in urban agriculture has been very low. Practically, none of the master plans of metropolitan areas and other towns in India have any component plan for urban agriculture. In fact, urban agriculture as defined in this paper is considered 'backward' in these development plans and is sought to be minimised if not eliminated by urban development programmes.

Urban agriculture, while being neglected by official policies, continues to survive through kitchen gardens, trees which produce fruits, vegetables and flower plants, grassland that produces fodder for animals and gardens and parks. The terms of trade between urban agriculture and other economic activities in the city are adverse to agriculture (FAO, 1981). Hence, it is in slow decline in the cities. There are certain types of urban agriculture which are not very productive nor meet the local needs of the population. In cities like Delhi vast amount of lands are devoted to cultivation of lawns. These lawns, while being aesthetically pleasing to the eyes, have no productive value. They consume enormous amount of water and are mainly for the benefit of the rich. This passion for lawns in urban landscape planning has its origin in the English colonial tradition of development of lawns. The same space can well be used for many other agricultural activities which are highly productive.

We find that presently, agriculture in urban areas does not help in meeting the urban needs in food, fuel, fodder, fruits and flowers. Its role is maintaining ecological stability and

sustainability is gradually decreasing. Its ability to generate and retain employment of the poor is low. Government sponsored urban development programmes systematically ignore urban agriculture. The control of land is with the speculators, developers and official agencies, rather than with the urban poor. The potential for urban agriculture, however, seems to be high and we would like to explore what ought to be the goals in this area and how they may be realised.

3.0 GOALS OF URBAN AGRICULTURE

The goals of urban agriculture in order of priority ought to be:

- a) Meeting basic needs of urban people for food, fuel fodder etc.
- b) Protection of environment and ecological balance
- c) Democratic control of agricultural resources including land
- d) Production for industrial needs (e.g. timber)
- e) Production of goods for exchange in the market place

This order of priority is essential if we want to develop a sustainable urban agriculture in the present socio economic context. The intended main beneficiaries of these goals are the urban poor who will be employed in and who will benefit from the output of urban agriculture.

4.0 A CONCEPTUAL FRAMEWORK FOR ANALYSING URBAN AGRICULTURE

Urban agriculture is a complex phenomenon, and can be viewed from different theoretical perspectives. To get a full understanding of it, one must attempt to review the plural approaches. Here, we will review some of the more important ones.

4.1 The crucial issues that inform urban agriculture are located at the intersection of three major institutions in our society; Market, State and Community. Market refers to the system of economic production, exchange and distribution of agricultural resources, inputs

and outputs. State encompasses the institutions of government at Central, State and local level. Community is the bond that links place and culture through households, nonmarket, collective institutions. Market, State and Community are each points of reference for a social order, informed by their interrelationships. Understanding and altering them will be the objective of our analysis.

It is very clear that if urban agriculture has to be developed exclusively through the market place, it will fail in a very short time. Market based policies for resource allocation, distribution and production in urban agriculture involving the use of demand/supply logic, efficiency criterion and regulation by the price mechanism will not be viable for urban agriculture. The market, as is structured now, is based on a division of labour and comparative advantage of specialisation. Urban agricultural products will always be at a disadvantage in a market place. Given the land price and competition for space in the city and high cost of conventional agricultural inputs, urban agriculture can never be economical on a large scale. Demonstration projects in urban agriculture are possible, though many of them need expensive resources and are not replicable on a large scale. Profitability, expansion, growth and diversification which are essential for the survival of private enterprise in the market place will not be viable goals for urban agriculture. Urban agriculture is territorial and if it must meet the basic needs of urban poor (that cannot be satisfied by the market place) it must be based upon a needs-use logic, local control of resources including land, social participation based on non-economic motivation and production of goods that will be primarily consumed locally rather than sold in a market for exchange (Friedman, 1981). Hence, the role of the market should be considerably restricted as far as urban agriculture is concerned.

The experience in Addis Ababa, Shanghai, Hong Kong, and Lusaka indicate that state intervention through public investment, promotion and extension can create a viable urban agriculture sector

(Wade, 1981; Granz, 1979; Newcombe, 1977). Through the use of voluntary organisations, cooperatives and public sector, a low energy-intensive, regenerative agriculture producing goods which are within the access of the poor, is shown to be possible in many of these places. The extensive growth of eucalyptus in Addis Ababa, firewood in Lae, vegetables in Shanghai, livestock in Hong Kong and social forestry in many other cities shows that significant proportion of urban food and fuel requirements can be met by urban agriculture. The demand for export of food and fuel on the rural areas will correspondingly be reduced, thus enabling them to reduce their environmental degradation as well as to improve the access of rural poor to food and fuel produced in rural areas. The environmental benefits indicate that such projects planned with state support can be highly productive. State support for research and development, extension, provision of inputs and encouragement of local planning and networks can be thus very useful in urban agriculture. The State can also be an arbiter between conflicting uses of urban space. As a lot of land is owned by municipal corporations and state governments, it can be used for urban agriculture and thus creating significant impacts,

Experience in socialist countries indicates that some form of nationally organised system of joint production and distribution in agriculture is equitable and effective (IDS, 1982). The collective form of such organisation as contrasted with private enterprises can be cooperatives, collectives or communes. Such collective organisation does speed up the growth of the output, encourage more rational use of land and labour, facilities, capital accumulation, research and training which are possible on a broader scale production and also result in reasonable amount of equality and welfare (particularly for women and children). It promotes modernisation and participation of the workers. There are limits to collective agriculture due to waste of resources, centralisation and bureaucracy. The experience of socialistic countries clearly shows that agriculture cannot be planned centrally in all its aspects. Decentralisation, local control and commitment are essential. Greater incentives for

producers are necessary. Small work groups and households, should have significant responsibility for agriculture.

Experience in India indicates that the State (at local, regional and national levels) represents the interests of powerful groups in society. At the city level, it has a productive function of providing infrastructure needed for sustaining capital accumulation in the private sector and has policies that favour the consumption of goods and services demanded by the powerful groups. The State also has an allocative function in its public expenditure policy that has similar objectives. Even the welfare policies indirectly serve these functions. In all large Indian cities, the urban development function has been, over the last 15 years, separated from the democratically elected municipal governments and made the responsibility of authorities that are technocratic and managerial, under the official control of state governments. This again reflects the nature of state in the social structure of Indian cities.

The neoclassical notion that the urban people exercise individual preferences from within a choice framework implies an implicit belief that study of individuals and households provided the understanding of the urban development process. This is a misplaced emphasis. With an unequal distribution of resources and power in society, an analysis of social constraints on individual's choice is more important. Preference is irrelevant, unless seen within the social and spatial context.

Such experience indicates that the State alone is not sufficient to promote urban agriculture. Community (households, neighbourhood and local associations and community norms) is thus very important in urban agriculture (D'Ath, 1983). In many cities of the third world, strong sense of such community based on class, caste and ethnic identity already exists. The modern city has been found to privatise and alienate people through their occupational structure, fragmentation in space and the market place. Urban agriculture can counteract this tendency and can strengthen urban communities.

The Urban Community Development projects in various Indian cities which attempt to improve the quality of life in low income neighbourhoods, demonstrate very clearly the power of the community in bringing about social change. Thus, an important policy goal in urban agriculture is to develop a contextually relevant optimal balance of power between community, state and the market place. Such balance does not exist anywhere in the world today, although interesting experiments are ongoing.

4.2 Cities have historically been net consumers of resources (Sachs, 1980). Large cities have usually proven to be the cities for elite and rich. Cities function as mechanisms for regressive distribution of income and wealth. Large cities are chronophagous (time devouring) due to slow, long distance transport systems and topophagous (space consuming) due to the rapid conversion of rural and farmland for buildings, transport etc. Most of the current urban development programmes focus on roads, water supply, improvement of slums etc. They largely concentrate on physical structures, involving new investment, benefitting some areas and some groups (Meier, 1981). The possibilities of using existing urban resources (physical and social) more effectively to meet the basic needs are usually ignored (Sachs, 1984). As costs escalate and assymetric flows of goods and people increase, the need for poor to become self reliant increases. As Kalecki has argued elsewhere, growth occurring from better utilisation of existing capacities may be far more important than growth originating from investments (Kalecki, 1972). In his now famous equation,

$$r = \frac{i}{k} - a + u$$

where

- r = rate of growth
- i = relative share of investment in GNP
- k = capital coefficient
- a = coefficient of real depreciation
- u = coefficient of improvement in the use of existing capacities.

For the poor, improving or to increase food supply becomes the microproblem of the urban ecosystem.

The wastefulness of existing resources through poor maintenance of services and facilities, wrong technological choice, or siting of production facilities, poor or no recovery of energy, materials or fertiliser from urban wastes and poor use of human resources are indeed very important to consider, in applying Kalacki's formulation to urban food systems. The pattern and uses of growth and not growth per se must conform to three criteria; economic viability, social usefulness and ecological sustainability. The human resources of a city can be mobilised and used through the market, households and collective nonmarket institutions. The physical resources of a city are land, water and idle production capacity. Effective utilisation of both these resources can increase food and energy supply to the poor (Meier, 1984).

4.3 The Technology for urban agriculture is fairly well known. Local research is, however, needed to generate new knowledge about multiple production cycles (vegetables, fuelwood, fodder, livestock, aquaculture, biogas etc.), using new spaces like roofs, balconies and backyards. The high productivity of small and marginal spaces in agriculture has been well established. A recent study indicates that 1 hectare is sufficient to generate balanced diet for 50 families (David Morris, 1983). In the experience of Bangalore where a large number of street trees are grown by the city's well known Department of Horticulture, 25 per cent of the trees bear fruits and many of them provide food for the animals as well. The potential of many Indian trees like Eucalyptus, Subabul, Mahua, Neem, Mango, Jamun and Tamarind for providing multiple products in urban areas is very well known (Govt. of India, 1976). These trees provide food, fuel, raw materials for industry and forage for animals. However, there should not be any reliance on a technological fix for urban agriculture. Technology can help in encouraging urban agriculture but there should be a corresponding change in the social organisation of production and distribution as well. Hence, the role of

professionals like agricultural engineers, plant breeders and agronomists should be selective in urban agriculture. The knowledge of the urban poor should have primacy in promoting urban agriculture and their active participation in decision making right from the design/research stage is crucial.

Among the new technologies, remote sensing appears to be of great potential for developing urban agriculture (Govt. of India, 1983). While the detailed information needed for large scale mapping of all categories of land use, land forms, characteristics in urban areas cannot be interpreted with satellite imagery, changes over time can easily be detected. With the development of better resolution imagery, remote sensing may become more useful over the next few years. Remote sensing used with aerial photography and detailed land based surveys for assessing land uses can be extremely productive. The Government of India has recently started a National Natural Resources Management System of which remote sensing data is an important part. The recently established, National Land Board and National Land Resources Conservation and Development Commission as well as the state Land Use Boards and Departments of Agriculture, can make use of this data. The land use assessment naturally has to be attempted, through a multi-stage data strategy: (a) Satellite maps (low, medium, high resolution), (b) Air craft surveys (covering sample regions) (c) Soil, land use, geomorphological and geological maps and (d) agricultural statistics. Remote Sensing data can now clearly indicate the different types of land use, climate, energy features, soil characteristics and the nature of agricultural practices. The impact of human intervention on urban growth can be dramatically and holistically learnt through remote sensing. The physical change of urban areas if related to socio-economic changes can provide a powerful tool for urban planning. Presently no such capability exists in India. The Municipal Corporations, the Town and Country Planning organisations, and the Urban Development Authorities have no capability to use such information. It is very important to plan for the use of this information democratically.

The remote sensing data, in a study of Ahmedabad, has provided valuable information of the nature of growth of the city over the last twenty years. For example, the extent of growth has been quite rapid and the density map indicates that in several areas population has been growing rapidly. Where the poor live, the density is inequitably higher. The vegetation and trees indicated by red in the false colour composites has reduced in some areas and increased in others. The barren land indicated by yellow has not changed significantly. The settlements indicated by blue is growing indicating suburbanisation. The potentially urbanisable land (presently fallow) appear like arrows indicating that over the next few years they will become settlements. The remote sensing data was validated with ground based surveys. Such analysis with remote sensing data can be invaluable in planning for urban agriculture. However, the high technology of remote sensing can become anti-democratic and alienating. Hence, in its design itself, the use of remote sensing information has to be necessarily included for social participation.

Permaculture is another growing phenomenon that needs attention when we look at urban agriculture. Permaculture is a gestalt, multipurpose approach to every site aimed at designing ecologically stable high yield food producing systems in which waste recycling plays an important role. It is not simply a collection of related technologies but a set of design principles. Permaculture experiments in different ecosystems around the world indicate that it has great potential in urban agriculture as well. In an urban environment, permaculture will seek to fit landscape, climate, plant and animal species, built environment and human beings in a stable high yielding system. Intensive gardening in homes using organic and kitchen wastes in three dimensional spaces has been demonstrated. Gardens producing vegetables, fruits, fodder and timber, in marginal land, organisation of food producer's cooperatives, polyculture in kitchen and market gardens have become widely known in permaculture experiments.

4.4 Another factor which is very important in urban agriculture is the role of informal sector. Informal sector can be defined to consist of units established, owned and operated by one or few individuals who neither possess adequate capital, skills or knowhow nor they have access to them. They tend to be small and labor intensive, reflecting the relative scarcity of labor and management skills. In Ahmedabad, (which is likely to be true of other Indian Cities as well) the percentage share of the informal sector in the urban labor force is around 40 per cent. In the urban food system, this labor would be engaged in gardening, poultry, dairying, retail trade etc. In urban planning exercises, such informal sector is usually ignored or discriminated against to eliminate or minimise their role for the following reasons:

- (a) Positive measures for this sector might exacerbate the urban crisis (for example resulting in more migration leading to poorer living and working conditions)
- (b) Most of the informal sector labor force consist of illegal encroachers, backward, socially undesirable and marginal people and
- (c) Informal sector is inefficient, small, use primitive technology and its productivity is low.

However, informal sector continues to grow rapidly in all Indian cities. The cost of creating employment in the formal, organised sector is much higher. Its role in meeting basic needs like food, shelter etc. is very essential. While, professionals (urban planners, bureaucrats, et al) may desire to eliminate them, informal sector does create self-reliant employment and fuller utilisation of human resources. Being outside the labour market operations, informal sector labour is not a commodity, and is, in fact, a bootstrap response to labor market imperfections and social inequity. In a labor rich but capital and energy poor country like India, informal sector should be encouraged, strengthened and given its rightful place. In the urban food system, use of informal labor at every stage can make a more effective use of resources, reduce

energy consumption and the need for capital. The experience of SEWA (Self Employed Women's Association) in Ahmedabad which has over six thousand members, many in the food trade, shows that informal sector with assistance to improve their skills, technology, credit, markets, can be a productive force.

4.5 Development Planning with reference to the urban food sector has largely been supply oriented. Given significant differences in incomes, needs and preferences, a disaggregated sectoral analysis by socioeconomic groups in an intertemporal framework is necessary for improved food planning in cities. Conventional demand analysis and computation of elasticity coefficients are of little value. Food entitlement of households in cities is largely through trade while in rural areas it is direct as well as through trade. Accordingly, the urban poor are more vulnerable to food and fuel disruptions. The dynamics of food consumption by the urban poor is influenced by population increase, urbanisation, lowered purchasing power, changing food habits, changing shopping habits and the decline of the urban ecology. The sources of food supply have also been shifting away from the city, making food supply more expensive and unreliable for the poor (Alan Manzoor, 1969).

4.6 Urban Food Marketing Systems are a major issue in urban agriculture. As argued earlier, production and distribution must be looked at simultaneously. It was mentioned earlier that action policies for agricultural production in urban areas (of cereals, milk, vegetables, fruits, poultry, meat, fish) do not exist. In the present urban planning framework, agricultural production is considered inefficient and undesirable. The food distribution system policies are somewhat better organised. There is a large private trade and a public distribution system. In the Indian cities, there is a direct, subsidised public distribution system for cereals (rice and wheat), sugar and kerosene, through fair price shops. These shops sell assured supplies of these commodities at controlled prices for the poor. For perishable food like vegetables and meat, there is reliance on private trade. The government constructs and

operates wholesale markets, slaughter houses etc. and controls quality of food, mainly from a public health point of view. Milk is supplied through a network of cooperatives or public sector companies at fair prices. The supply of milk to cities has dramatically improved in the last 10 years as many middlemen were eliminated and producers' cooperatives were organised to get access to technology and finance. For other perishables, the supply of quality products, continues to suffer with unreliable deliveries and high prices. The current emphasis in government seems to be on new facilities (which may remain underutilised) while more emphasis is needed on human, institutional aspects of the marketing system. As the administrative structure is fragmented and commodity oriented, there is not enough coordination among agencies. For example, the Ministry of Agriculture strives for high procurement (support) prices for crops, while the Ministry of Food is concerned with the distribution system with low prices. The Municipal government is concerned with infrastructure for wholesale and retail marketing.

4.7 We recall Marx who said that the ruling ideas of an epoch are the ideas of the ruling classes. In reviewing the status of urban agriculture, this statement can be said to be extremely valid. The pattern of resource allocation for urban development consider the interests, preferences and goals of the powerful groups. The neglect of resource conservation and management, the failure to address the food needs of the poor and the tendency to promote spatial differentiation and specialisation of economic activities - all these reflect the dominant ideas and interests about what constitutes progress and development. In the face of mounting evidence of urban crisis, traditional ideas about urban growth continue and the cities become more parasitic than ever. (Davidson, 1984). But locked up in cities are wasted resources, land, energy, buildings and people who could be managed differently, to save money, create jobs, promote training in new skills, fulfil basic needs and regenerate a community.

The attitudes of the planners and administrators however are different. Urban waste is seen as material for disposal, vacant land is awaiting development, green space has to become parks and lawns. The administrative fragmentation and lack of coordination facilitate such partial views, leading to the practice of considering environmental protection and improvement as an "expenditure" activity rather than one of long term benefit (Hardoy and Satterthwhite, 1984; Boyden, 1979). Massive public education may be needed to change the consciousness of people; perhaps even more important, a change in the material conditions of people and social structure which give rise to ideas and values in our society.

4.8 In addition to land (which is scarce and the alternative uses for land in the current framework are more attractive than agriculture), water is a key resource for urban agriculture. Many cities in India face acute water problems (Centre, 1982). Ground water ~~table~~ have been found falling. Most households have to satisfy themselves with water supply restricted to less than 3 hours a day. In these cities, water problem is seen as simply to get more water from any source at any price. As with energy and food, it makes more sense to ask what the water is wanted for, what amount, quality, and source of water will do for each task at the least cost. Instead current water policy focuses on:

- more water rather than efficient and equitable uses of water
- gigantic projects rather ~~than projects on appropriate scale~~
- highest quality water for all uses
- pricing water at very high subsidies for all uses
- poor monitoring of long term trends including depletion and pollution of ground water.

Water for agriculture will compete with other uses in the city. However, currently, technologies are available for efficient water

use in agriculture. If urban agriculture can be designed in a way that is regenerative and not based on mining of water, soil and fuels, then it can be effective.

4.9 Historically, uneven development of urban and rural food and energy production depicts, a systemic relationship of unequal exchange and dependency. If urban agricultural strategies should alter this relationship, it would mean a profound transformation of the role of the cities and structure of urban economic activities and life styles. If we have an understanding of the structural and historical processes at work, then we can realise the limits of what we can and cannot do in urban agriculture. This again is a plea for holistic approach to strategic planning in urban agriculture rather than considering urban agriculture as a series of demonstration or pilot projects. Thus, urban agriculture cannot be an 'additional programme!. Rather it should be seen as a part of the total urban development process itself. As context and participation are primary in such a vision of urban agriculture, we can understand its role through the transformation of urban community and not vice versa. In other words, we should not seek a model/theory of urban agriculture to be replicated or implemented, across contexts. Such a model can only be reinvented each time, so that endogenous capacity gets strengthened.

4.10 There are several constraints in implementing an urban agricultural programme. Some of these are: (Di Castri et al, 1981; UNESCO, 1979).

- a) a) Lack of overall policies and goals.
- b) b) Lack of information system to collect and process information.
- c) c) Lack of managerial skills and resource people.
- d) d) Isolation between scientists, planners and managers.
- e) e) Sectoral administrative structures and funding pattern.
- f) f) Lack of multi-level coordination.
- g) g) Lack of understanding of the aspirations of local people.
- h) h) Lack of democratic processes of participation.

5.0 URBAN AGRICULTURE IN AHMEDABAD

We present here a case study of urban agriculture in Ahmedabad particularly focussing on vegetables and fruits. These are the tentative results of an ongoing project, at the Indian Institute of Management, Ahmedabad. First we outline a profile of Agriculture in Ahmedabad district which is almost equivalent spatially to the Ahmedabad Metropolitan area. We then look at the landuse and resource pattern. Further, we review the institutional structure and downstream waste disposal issues. Finally we look at the problems of promoting agriculture in the Ahmedabad context. The objective of this project is to generate viable alternatives in urban development that address the needs of the poor, and are environmentally sustainable and democratic.

5.1 Ahmedabad, a city of over 3 million people is about six hundred years old, an industrial city in Gujarat, Western India. It has a semiarid climate. The rainfall is mainly between June and September (20" per annum). Soil is predominantly sandy loam, clay type sticky and medium black. 50 per cent of the population live in slums, chawls and hutments in different parts of the city, mainly on the eastern side of the river. About 25 per cent live in pols, old clusterhouse communities. The following Table portrays the expenditure pattern in different households in the city.

Table 1

Consumer Expenditure in Ahmedabad, 1980

No.	Household type	Percentage of population	Consumer Expenditure	Expenditure as% of total	%of farming income spent on food	% of daily expenditure
1.	Apartments, Houses, Pols	63	3200	83	34.5	6.97
2.	Chawls and Tenements	15	350	9	53.0	3.17
3.	Slums	22	310	8	62.0	1.71

Source: Sardar Patel Institute of Economic and Social Research, 1980.

The poor constitute the last two categories and many of them spend money to purchase foods from roadside stalls, street vendors, small hotels - which are nutritionally poor.

In a 1976 study of the urban poor in Ahmedabad by the Ahmedabad Municipal Corporation, it was found that the poor do consume a variety of foods. However, higher priced food items like milk products, some vegetables and meat were consumed infrequently. Using the nutritional standards developed by Indian Council of Medical Research, it was found that 60-70 per cent of the poor had some form of nutritional deficiency (calories, protein, fat, vitamins and minerals). In this survey findings the average per capita expenditure was Rs.30 per month. The wholesale price index has moved up from 163.6 in 1976 to 234.2 in 81-82 (about 42%). The average income of the poor, however, has gone up by only 20 per cent during this period, thus worsening their food purchasing power and nutritional status. The food production shifts in the metro region, higher prices due to transport costs, control by middlemen leading to hoarding and scarcity, higher prices due to purchase of small quantities at a time and the lack of hygienic food places are some of the reasons that affect the food security of the poor.

The public distribution system for food in Ahmedabad, it is estimated, caters only 20 per cent of the food requirements of the poor. In 1978-79 there were 415 fair price shops, for 267968 ration card holders and they sold at controlled prices only 42720 quintals of food grains. Even this limited coverage does not reach the poor. The poor whose cash flow position is always precarious almost always get no credit facilities from public distribution shops. Their location is often inconvenient for the poor and as they insist on standard quantities (once in 15 days or so) to be purchased, the poor have a handicap in not being able to purchase small quantities. All these factors contribute to a situation where a large number of poor are excluded from the public distribution system (contrary to its objectives) and many middle income families can benefit from it.

According to a forthcoming study (Suganda Ganapathy, 1984),

- 2/3 of urban food consumption is by 1/3 of population
- 50% of population (the poor) consume 16% of cereals, 32% pulses and 10% of the vegetables
- There is a rapid reduction of subsistence agriculture in the metro area.
- The major vegetables consumed in Ahmedabad are potatoes, onions, eggplants, cabbage, tomatoes, cauliflower, green peas, chillis and lemon in different seasons of the year.
- Total arrivals of all vegetables, according to the Agricultural Produce Marketing Committee in 1982-83 was worth Rs.444 million and weighed 3.25 million quintals.
- 20% of the vegetables consumed in the city are produced within the metroregion and the rest come from distances upto 1500 km. The same situation prevails in case of fuelwood.
- The per capita consumption in 78-79 in the city, of vegetables is 160g/day/person, while the national average is 100g./day/person. The recommended intake is 185g./day/person. These averages, of course, mask the highly inequitable distribution of nutritional intakes.
- There is a substantial rise from 1966 to 1977 in the population of milch cows, buffaloes, sheep, goats and pigs in the city due to increasing demand for milk products and meat.
- The domestic energy consumption that depends on lifestyle, ethnic background, technology of cooking has been undergoing a change. Presently, power (28%) kerosene (35%) charcoal (8%) firewood (7%) and LPG (20%) is the mix.
- In the area cultivated, area under wheat, bajra and jowar - major cereals used by poor has shown a persistent decline over the last 20 years, while rice, fruits, cash crops and pulses have shown an upward trend.
- Higher costs (transport and production), poor access, shifts in production mix are some of the main reasons why the food consumption by poor is qualitatively declining.

5.1 Vegetables and fruits hold considerable potential for cultivation in Ahmedabad. Tenure to land, access to credit and marketing, availability of inputs (seeds, seedlings, fertiliser, pesticides, tools), expertise in skills and organisation are some of the major reasons that determine success in agriculture production. For example, Prantij, a village 20 km. from Ahmedabad, has increased the land allocated for vegetable production from 25 per cent of the total to 75 per cent of the total in 10 years. A Producers Cooperative in this village was able to produce the ~~positive deter-~~minants of success mentioned earlier. Most farmers generate enough resources as surplus. In contrast, another village, Delgam, 5 km. away from Ahmedabad, a village similar in size and geographical characteristics, and which had higher vegetable production than Prantij in 1965, had, by 1978, half the production of Prantij. The profits of farmers in Delgam was only two-thirds of profits in Prantij because they pay higher commission to intermediaries. The farmers in Delgam pay higher transport charges as transport is arranged individually. The main reason for this is the absence of a Producers Cooperative in Delgam. The Cooperative at Prantij was able to accomplish all these, as we have noted earlier (Sugandha Ganapathy 1984).

5.2 Let us presently review the land use pattern in Ahmedabad metro area, which includes the city proper, four urban centres and 154 village panchayats.

Table 2

Landuse in Ahmedabad, 1978 (in '00 hectares)

	Residen- tial	Indus- trial	Commer- cial	Roads etc. Trans- port	Agri- cul- ture	Public pur- pose*	Vacant Govern- ment land
1. Ahmedabad	58.85	12.43	3.88	5.49	31.99	14.16	-
2. Urban centres (4)	2.42	1.21	3.70	3.39	87.04	1.21	1.25
3. Village pan- chayats (154)	13.78	10.35	0.92	26.74	857.22	0.32	84.01
4. Total area	75.05	23.99	8.50	35.62	1016.25	15.69	85.26

* Public purpose includes land used for parks, playgrounds, hospitals etc. It includes both built and vacant area.

Source: Ahmedabad Urban Development Authority: 1981 Master Plan.

Thus, agriculture continues to be important in the Ahmedabad metropolitan region. In the city, 25 per cent of the area and in the metropolitan region that includes 4 towns and 154 villages, 80 per cent of the land is used for agriculture. Barren land has decreased by about 10 per cent in the last ten years (Source: AUDA master plan 1981). ~~Forest~~ land has increased by 400 per cent (perhaps due to timber, fuelwood and eucalyptus plantations). Cultivable waste land has decreased by 15 per cent, fallow land has increased by 50 per cent (pending conversion) and net area sown has decreased by 7 per cent. Pasture and grazing land has increased by 10 per cent. On the whole, in the last 10 years, the overall reduction in net sown area has been compensated by increase in pasture and grazing, fallow and forest land.

The following Tables indicates the changes in area cultivated and yeild/hectare over a 10 year period in Ahmedabad metro area.

Table 3
Area cultivated in Ahmedabad Metro Area
('00 hectares)

No.	Item	Year 70-71	Year 77-78
1.	Cereals	36820	27880
2.	Pulses	1210	1780
3.	Fresh fruits	140	250
4.	Vegetables	250	460
5.	Cotton, fodder, oilseeds	26200	29780

Table 4
Average Yield/hectare in Ahmedabad Metro region (Kg.)

No.	Item	Year 1968-69	Year 1977-78
1.	Rice	797	1413
2.	Wheat	1196	1433
3.	Jowar	660	772
4.	Bajra	246	808
5.	Barley	418	5383
6.	Maize	406	1223

Source: Season and Crops Reports, Directorate of Agriculture, Gujarat.

These Tables indicate that while cash crops have increased in acreage, cereals have declined. Within cereals, wheat, bajra and jowar acreage have declined (mainly the food of the poor) while rice acreage has increased. Vegetables and fruits acreage have nearly doubled. Productivity of all crops have increased due to better irrigation and provision of inputs. This has compensated somewhat the production losses of cereals due to fall in acreage.

5.3 We focus presently on vegetables and fruits cultivation.

Market gardens and Home gardens are found in practically all the village of the Ahmedabad metro region. There has been a substantial increase in them in the recent years due to growing demand for vegetables and fruits by middle and higher income groups. Unlike home gardens, market gardens practice cultural management, pest control, fertilisation, wage labour, irrigation etc., systematically thereby increasing the input costs. These costs can be only balanced by the sale of the products. These gardens also generate cash income, a vital need for many among the poor.

Home gardens are popular among middle and higher income households who have some land in the front or backyard for cultivation. However, by and large, these are developed for aesthetic reasons (as the preponderance of lawns, decorative plants and flowers show) and production is not the main objective. Scientific agricultural management is not so prevalent in home gardens. Availability of land, water, seeds and seedlings supply systems and the problems of theft and protection are some of the other reasons that inhibit the growth of home gardens. But, as many of them are mixed gardens (not monoculture), they have the potential to provide food, fuel, medicines, spices, building materials, fodder, fibre etc. Coupled with small domestic animals (which provide animal protein and fertiliser-waste and which eat garden wastes), the home gardens can be low input - high output permaculture efforts. David Morris (Morris, 1983) has estimated that in subtropics, on the basis of a six month growing

season, a fully balanced food can be derived from 2500 sq.ft./person. For a family of 5, about 0.1 hectare will be needed. For a population of 3 million in Ahmedabad (about 600,000 families) about 60,000 hectare will be needed. Referring back to Table 2, the agricultural land available in Ahmedabad metro region (101625 hectare) is more than sufficient to make Ahmedabad self reliant in food production. However, this is only a theoretical possibility. The present mix of crop production, market linkages, food trade, productivity of current agricultural practice, all provide major barriers to such restructuring of agriculture to make Ahmedabad self reliant in food.

In reviewing the potential of urban agriculture in Ahmedabad, one should not ignore the role of trees. Trees are ecologically beneficial, economically productive and can meet many needs of poor. The following Table describes the major trees that are found in Ahmedabad region and their uses. As there is no tree census, it is difficult to estimate the extent of their cultivation.

Table 5
Trees and their uses in Ahmedabad

Species	Uses
Brain tree	Cattlefeed, shade
Drumstick tree	Cooking, medicinal
Curryleaf tree	Cooking, medicinal
Indian Gum-Arabic	Timber, fuel, fodder, land reclamation
Mountain Ebony	Fodder, bark for tanning, wood, medicinal
Native Teak	Timber for furniture
Gooseberry (Linn)	Food, tanning, dyeing, inks
Eucalyptus	Wood, Charcoal, pulp, medicinal
Spung	Pods for fodder, fuelwood, medicinal
Casuarina	Fuelwood, land reclamation, wind breaker
Neem	Toilet soap, medicinal, shade, insecticide
Guava	Fruits, wood for toys, tanning
Lagerstrawethia	Timber, bridge building, boats
Flame of the Forest	Rope and paper making, fuel, dyeing, medicinal

Source: Community Science Centre Environmental Education Programme, Ahmedabad, 1981.

5.4 The provision of extension services and inputs by government agencies for urban agriculture in Ahmedabad is a key ingredient for its survival and growth. We describe here the activities of four important government agencies in this regard. The National Seeds Corporation (a Central Government public enterprise) supplies 230 varieties of seeds of about 70 crops every year in Ahmedabad to farmers, government agencies and cooperatives. The Directorate of Agriculture of Gujarat Government supplies seeds, saplings, fertilizer, pesticides and provides technical advice on gardening at a low cost. The Ahmedabad Municipal Corporation operates a canning and kitchen garden programme which also provides similar service for garden owners. The activities of the Municipal Corporation in 1983-84 are:

Table 6

Ahmedabad Municipal Corporation Kitchen Garden Scheme

No.	Activity	Number in 1983-84
1.	Kitchen gardens served (technical advice etc.)	335
2.	Vegetable seeds packets supplies	78,580
3.	Supply of samplings	77,890
4.	Technical advice cases	635
5.	Supply of packets of fertilizer, insecticides etc.	10,370
6.	Kitchen garden competition awards	1
7.	Miscellaneous guidance cases	1,615

Source: Ahmedabad Municipal Corporation records.

The Ahmedabad Municipal Corporation Parks and Gardens Department also has a tree planting programme in roads, schools, sports stadia, playgrounds, parks etc. About 30,000 are planted every year. For a while, the plants are protected from animals and theft by weldmesh

treeguards (fencing). During Vanamahotsava (tree planting celebration) in July and August every year, the Department distributes nearly 100,000 tree saplings of different varieties free to citizens through sixteen centres located throughout the city. There is no data available on how many of these trees survive and mature. Every year, this Department chooses 5 new sites for gardens and parks in public land for development. There are now 54 public gardens in the city, which mostly have flowering and shade trees. Cuttings from these trees are used for new parks. The Department has the responsibility for clearing, felling and disposal of trees and provide floral decoration at public celebration. Its budget in 83-84 was Rs.5.6 million and it has a staff of 450 people (who are paid on an average Rs.20/day). Grass from municipal gardens is ~~auctioned~~ off. Generally the Department does not plant fruit bearing trees to avoid disputes and thefts. The grass cutting contractors are usually tribals living in slums who own small number of cattle and who operate neighbourhood milk supply business.

The total fertiliser consumption in 1981 in Ahmedabad district was: Nitrogenous: 13981 tonnes; Phosphatic: 3230 tonnes; Potash: 586 tonnes. These fertilisers are supplied by fertiliser companies located nearby. Besides the government agencies assisting urban gardens, there are many private nurseries, large private gardens and commercial vegetable farms in the city. Information on these is not available. The extent of use of organic fertilisers, mixed gardening or permaculture practices in the metro area is not known.

5.5 In dealing with agricultural production in Ahmedabad, we turn finally to the sewage treatment. Solid wastes such as garbage, leaves etc. are usually collected by the "Harijan" employees of the Refuse Department of the Municipal Corporation and dumped at specific dumpsites. From these, they are collected and transported by trucks to a large municipal sewage farm outside the city. The dried part is used and sold as fertiliser. Other residues are used for landfillings in low lying areas. Liquid wastes are treated differently.

Till 1978, treated water from sewage farm was supplied to farms for irrigation and the grass grown in the sewage farm was sold as fodder. As this has resulted in rapid growth of mosquitoes, the farm has stopped this practice. A biogas project to produce methane and fertiliser from sewage is in the plans but has not been implemented. There are two sewage farms now, one is in Pirana in the eastern side of the City, handling 72 mill.gallons of water daily. The other is the Vasna farm on the western side which handles 62 million gallons of wastes daily. There is no systematic assessment or plans for recycling and recovery from urban wastes.

5.6 The Distribution System for vegetables and fruits is extremely critical. As we had argued earlier, the production and distribution systems have to be simultaneously understood if we want to promote urban agriculture for meeting the food needs of urban poor,

5.6.1 Historically, the distribution system in Ahmedabad consisted of wholesale traders, commission agents and retail vendors (including hawkers). There was considerable ~~exploitation~~ of the vegetable producers from the periurban area and villages. Because of intermediaries, both producers and consumers suffered. In 1948, for the first time in India, a Agriculture Produce Marketing Committee (APMC) was organised in Ahmedabad on a statutory basis. Under legislation, the power of APMC extend upto 12 miles around Ahmedabad, where it regulates wholesala trade in vegetables. The APMC operates a wholesale market-yard in Jamalpur in Ahmedabad where all producers bring their produce. It enforces correct weights and measures, arranges immediate cash payments to farmers. It ensures a fair auction system and operation of free markets. It provides space (95 vegetable stalls) and other infrastructural facilities (auction hall, cellar for storage etc.). The Executive Committee (of APMC) consists of 17 members (8 farmers, 4 traders, 2 cooperative nominees, 1 Municipal Corporation nominee and 2 state government nominees). The committee has a four year term and its budget in 1981-82 is Rs.1 million. It also has a reserve fund of Rs.8 million. Its revenue comes from ~~floor~~, charges and rent.

The APMC handles about 12,000 quintals of vegetables daily that arrive from all the neighbouring communities and even beyond by trains, trucks, rickshaws, cycles, handcarts etc. from 4 AM to 2 PM every weekday. In fair auctions, farmers collect cash immediately. About 60 per cent of the vegetables come to APMC outside the 12 mile limit and about 60 per cent of the sales are also made to people outside the limit. The intermediary commission agents have been abolished and producers get economic prices. The institution of APMC is one of the main reason for rapid expansion of vegetables and fruits production in the Ahmedabad metro regio.

5.6.2 In addition to village based producer cooperatives described earlier, there is a major cooperative known as the Ahmedabad Cooperative Vegetable and Fruit Growers Association which has over 2000 members spread over three adjoining districts. The Chairman of this Association is also the Chairman of APMC. Its purposes are to provide alternative marketing channels, ensure economic prices for producers, minimise exploitation and provide inputs to farmers in a reliable and cheap manner. The Municipal hospitals, for example, buy from this Association only. While this Association and APMC have been successful in somewhat narrowing the difference between wholesaler and producer prices, they have not been able to do much to minimise the difference between wholesaler and consumer prices. The following Tables illustrate the price structure in 1981 of vegetables and cereals.

Table 7Average Prices per Kg. of vegetables in Ahmedabad in 1981 (Rs.)

No.	Item	Wholesale Price paid to producer	Price paid by Retailer	Price paid by consumer
1.	Tomatoes	0.95	2.05	2.70
2.	Onion (green)	0.35	0.70	2.25
3.	Fenugreek	0.75	1.15	1.80
4.	Okra	1.55	2.70	3.80
5.	Eggplant	0.60	1.50	2.00
6.	Green peas	2.75	3.25	4.50
7.	Cauliflower	0.75	1.55	2.70
8.	Clusterbean	0.75	1.55	2.70
9.	Chillis (long)	0.65	0.90	2.50
10.	Carrots	0.55	1.50	3.00
11.	Drumsticks	1.75	2.50	4.00
12.	Potatoes	1.00	1.30	2.00
13.	Onion (dry)	0.45	0.85	1.70
14.	Lime	2.25	4.80	5.30

Table 8Average Prices/Quintal of Cereals (Rs.) in 1981

No.	Item	Wholesalers' price	Retailer's price	Consumers price
1.	Rice	123	333.50	370
2.	Wheat	116	210	240
3.	Bajra	110	175	195
4.	Jowar	116	165	198

The Tables show that in spite of long historical developments in producer cooperatives and government interventions, the inequities in the price system remain. The APMC has very little to do with production. It does not operate or regulate fair price shops. At retailer and consumer level, the APMC has practically no control. Even the Ahmedabad Vegetable Cooperative Association operates like a commission agent. There is practically no work on removing the burden of hawkers or other technological issues like grading, packaging, preservation, waste disposal, consumer education or production itself. Producer technical knowhow and capability still remains to be developed fully.

5.6.3 There are special problems in organising vegetable marketing. Some of these are :

- Perishability (average life 48 hours), unless stored in cold storage. (existing refrigeration facilities are poor and expensive).
- Unlike milk, vegetables have too many types, sizes, colour; standardisation is difficult.
- Great variations in prices from one day to another, even within the same day from morning to afternoon.
- No financial mechanism like a Price Stabilisation Fund.
- As major vegetable types are substitutable, this results in sharp variations in demand for individual vegetables and thereby conflicts in product mix among cooperative members.

5.6.4 Retail marketing of vegetables in Ahmedabad is mainly done through cabin vendors, cart vendors (mobile and stationary) floor vendors and basket vendors. A large majority of hawkers are poor and many are women. The physical burden of these vendors, long hours of work, indebtedness, low profits, poor infrastructure (space etc.), high occupational insecurity and poor credit remains as major problems. The retail vendors (numbering probably about 10,000 in Ahmedabad) remain in informal sector. The ~~retailer~~

margin, as we have seen, is high due to the perishability of stock and poor (or expensive) cold storage facilities. The retail vendors sprinkle water on vegetables to keep them fresh. However, excessive sprinkling may spoil vegetables. The losses on an average at retailer level amount 20% and carry over stock overnight can amount as much as 1/3 of the total (Suganda Ganapathy, 1984).

5.6.5 The key decision makers in poor and middle income families in the purchase of vegetables are the housewives and in hotels, hostels, canteen etc. commercial/purchase managers. For higher income households, the family servant makes the purchase of vegetables. Most of the purchasers are not aware of the nutritional aspects of vegetables nor they know how to combine vegetables in a nutritional manner. Traditional food of many communities is nutritious. However, under the pressure of time, energy and changing lifestyles, new nutritional knowledge is essential. Many vegetable purchasers consider convenience of access and prices as the most important factors, in their decisions.

5.6.6 The case study of Urban Agriculture in Ahmedabad is admittedly partial and it presents results from an ongoing study. From the case study, a complex tapestry emerges of the practice and possibilities of urban agriculture. Economics, Equity, Social structure, Ecology, Employment, Basic needs, Energy conservation, Self Reliance, Technology, Institutional Structure and Democratic control - all are involved. The dynamics of urban development and the role of urban agriculture in it are ill understood. The Ahmedabad case study provides us a concrete illustration to test the conceptual framework developed earlier. In the next section we outline strategies needed for the development of urban agriculture, based on the conceptual framework and the Ahmedabad case study. Further work in Ahmedabad in the form of action-research will be reported in a subsequent paper.

6.0 STRATEGIES FOR DEVELOPMENT OF URBAN AGRICULTURE

Given the nature of urban crisis and the potential for agriculture to address the crisis, I would like to develop a set of strategies for the development of urban agriculture. Presently there is no stated policy regarding urban agriculture in India. The strategies outlined here are exploratory in nature. Their relevance and effectiveness will have to be determined by experimenting with them. A priori, a master plan for promoting agriculture cannot be developed, as we had indicated earlier. Both structure and situation are important in determining the effectiveness of any strategy.

The State has to play an important role in the promotion of agriculture and in countervailing the market forces. Urban economic activities are highly integrated with national and international market systems. To contain the forces of the market is obviously a difficult task. But as we have noted earlier the market has only a very limited role to play in urban agriculture. Public expenditure in promoting research, education and extension, comprehensive land use planning and regulation, and development of institutional systems and organisations for production and distribution can be major state contributions.

The promotion of producers' cooperatives (like AMUL for dairy industry in Gujarat) neighbourhood associations, citizen groups voluntary organisations through financial assistance will be an important State role. Similarly encouraging coordinated production plans would be very important. Multiple use urban agriculture can be planned only in a coordinated fashion. The experience of All India Coordinated Research Projects of the Indian Council of Agricultural Research in promoting dry land farming, oil seeds production and fruits is an important model which may be relevant for promotion of urban agriculture. Important areas for research and education seem to be genetics, development of horticultural species, strengthening and improving trees like subabul, neem, and mahua, soil conservation, multiplication of seeds and seedlings through

vegetation propagation and tissue culture appropriate planting technologies, disease resistance, yield improvement and improving survival rates. The State, however, should not assume direct operation of urban agriculture by setting up a big bureaucracy. The experience of socialistic countries indicate that such endeavours will fail. Urban agriculture can be highly productive, as it needs low investment, and is ~~substantial~~ and has many long-term environmental benefits. It is an important welfare strategy as it would produce the needed basic food and fuel for the urban poor. The energy consumption pattern in cities can then shift in favour of renewable sources. The destruction of rural forests for meeting the urban demand in wood and charcoal will also be considerably lessened. The city will become more self reliant in energy as woodfuel, biogas and solar energy can increase their share of urban energy consumption. Simultaneously, the expenditure for energy embodied in imported food can be reduced.

The State also can use incentives, subsidies and tax rebates in a limited way to promote urban agriculture. Agricultural revenue is exempted from income tax regulations in India. This legal provision can be an incentive for private owners to engage in agriculture. Fruits and flower orchards around Bangalore have come up in large number recently because of this provision (Rao and Tiwari, 1979). Other possible means are state farms, energy plantations etc. However as we have noted earlier the growth motive of private enterprises in urban agriculture has to play necessarily a limited role. A large role for private sector in urban agriculture will not result in reaching the goals mentioned earlier. However, as a large amount of land is owned by private owners, such incentives may play a role in extending urban agriculture (US-AID, 1982). Similarly regulation through zoning, prohibition of certain activities, preservation of green space and use of public land for social forestry (e.g. tree planting along railway lines, road sides, marginal land etc) can be encouraged by regulation. The current urban planning regulations, and land ceiling legislation can considerably be modified for this purpose. Urban Cooperative banks which are slowly gaining ground, can be used as a major financing source for urban agriculture.

The State should support decision making regarding urban agriculture, primarily by the cooperatives or local organisations. Social ownership of land as well as land acquisition for urban agriculture under existing legislation, will be very helpful. Resistance to such redistribution of land ownership in the city will be extremely high as land is a major source of profit in the city. There is also a need to recognise the tension between decentralised urban agriculture and the need to coordinate from the urban/regional perspective. These conflicts should not be brushed aside but rather should be tackled by negotiations. Combining individual, decentralised responsiveness and collective norms of a community is a major challenge. The State needs to play a supportive, catalytic role to encourage community building. This is clearly a non-dirigist view of the state, and is inconsistent with present day reality. However it is possible to conceive such a role for the State.

The existing structure of the Indian cities, as we have noted earlier, has grown along with growing peripheralisation of the neighbouring region and marginalisation of the poor. If urban agriculture is to grow significantly in this structure and spatial pattern, a mere demonstration approach will not suffice. We also observe that in Indian cities, the process of urban development is not simply one of the modernisation but one of the greater modernisation combined with greater use of tradition. It is the coexistence of traditional and modern, urban and rural, rich and poor that characterise the growth of Indian cities. The physical growth of natural areas and their social position are highly related to one another. Such physical and social growth occurs by accretion and accommodation rather than by replacement (Towari et al, 1983). Thus urban life is characterised by history, density, complexity and heterogeneity. Urban agriculture in such cities needs to be very carefully planned and must be socially acceptable. Any effort in urban agriculture must be preceded by such understanding. The State can facilitate such understanding through its research and survey organisations.

There are many other aspects of urban agriculture which the State can promote. Vegetables and fruits can be cultivated with recycled sewage water, grass and fodder can be grown in marginal lands for the animals. Land can be allotted in various parts for dairying cooperatives in the city. The dairy farmers and small growers of vegetables who are now leading a precarious existence can be encouraged. Given the Indian religious tradition of the use of flowers, there is a great scope for the growth of flowers in cities. Nectar bearing flowers can be propagated for proliferation of bee fauna. Lotus which is India's national flower has both food and ornamental value. Its growth can be encouraged in the many ponds and lakes in the cities. Medicinal and aromatic plants like sandal, palmarosa and lemon grass, mint and fruits like mango, bananas, citrus can be grown in the urban environment. The groups in each city need to undertake experiments and to grow plants that are consistent with local geographical, climatic, social and soil conditions (Goodman and Love, 1982). Indian experience in rural agriculture suggests that monoculture is undesirable and multiple cropping is needed to maintain an ecological balance in the long run. Such a decision can be taken only on nonmarket considerations. The focus in urban agriculture should be primarily that of agricultural production for local needs of food, fuel and fodder and secondarily that of environmental improvement (a permaculture approach). The Municipal Corporations should encourage the development of botanical gardens within the city areas to preserve the species, to develop nurseries and seed giving programmes as well as places for recreation. Again the excellent gardens of Bangalore come to our mind as an example. It is not easy to replicate the Bangalore experience of land use because historically, the importance of agriculture in Bangalore has been very high even prior to the British colonial days. The use of ornamental trees like Gulmohur are very important and a few Indian cities have taken up their cultivation as roadside trees. The Delhi experience in creating urban forestry for natural learning is another example of enlightened urban agriculture policy.

As there is a variety of owners of urban land, each one pursues his own interest. In the present structure, Municipal Corporations have some authority over private land use. However, because there is no specified urban policy regarding agriculture, one finds usually a hodgepodge of species, ages, sizes, and conditions varying from lot to lot, neighbourhood to neighbourhood. Some advice and regulation regarding what can be grown in which area, seem necessary.

There are three management needs in urban agriculture. (Gray and Deneke 1978).

a. Planting; b. Maintenance; c. Removal.

The Indian experience of Vanamahotsava is worth recalling where millions of trees are planted all over the country but later 90% of them die for want of proper maintenance. This suggests that planting must be planned alongwith the maintenance. For example, while the city governments usually maintain parks, they do not take clear responsibility for the maintenance of road-side trees. Similarly location of trees and crops with reference to roads, housing developments, intersections etc. need to be planned very carefully. The form, size, texture and colour of trees and their blooming seasons have to be clearly kept in mind. Their growth needs to be managed by providing irrigation and fertilisation and control of competing vegetables. The removal of trees (including their utilisation and disposal) are generally ignored in cities. The removal must be authorised, planned and funded properly. Urban agriculture can be a sustainable yield system. It has been estimated that an average urban tree is worth about Rs.800/- Hence, the return from urban forests can be quite significant. An important part of the maintenance strategy should be to have a city-wide agricultural inventory.

The city government needs to provide an annual budget for the management plan. Local groups and neighbourhoods can also generate resources for urban agricultural development. The importance of

public education and creation of public awareness about urban agriculture through formal and nonformal programmes, access to horticultural and agricultural department, media and information surveys are very important. Employment in urban agriculture can be quite significant as it is a labour intensive activity. One cannot overemphasise the importance of the institutional mechanism for citizen participation in urban agriculture. Many urban governments in India are decentralised and zonal/ward committees do look at local issues. These committees can be activated and enabled to deal with local urban agricultural problems. Maintenance can be significantly of high quality if handled locally.

Urban agricultural projects cannot be planned independently of each other using a compartmentalised project appraisal approach. The production of food, biofuel, animal food etc may have to be planned jointly because they are linked to each other, through the flow of material or energy. Single purpose agricultural projects evaluated on mainly economic basis, would be irrelevant for urban agriculture. Food, energy and environmental effects should be considered together on a specific site, based on the ecological complementarity of various activities. Clearly an 'ecodevelopment' strategy is needed for urban agriculture planning. Only then, a study of urban agriculture will lead us to questions of urban energy and use, structure of economic activities, history and culture, ecology, environmental sustainability, transportation, land ownership, the production and distribution systems, the social relations in the community etc. All these are somewhat autonomous questions, but at the same time, interdependent and interactive among themselves and with the external environment. To do such planning appropriately, we have to rely on many sources of information. Census data, empirical observations, surveys, remote sensing data and citizen data generated through processes like workshops and community meetings—all will be necessary. Here again, the importance of

community based organisations and collective institutions are vital. It is possible to model urban agriculture, based on such data, to analyse the impacts for policy alternatives. Such efforts however have not been done so far in India.

7.0 CONCLUSION

The experience of green revolution and 'scientific' forestry in India enables us to learn about the uneven nature of our development process. The choice of goals, technology, production mix indicate that certain types of decisions were taken that affected the rights of rural poor and tribal population. Their impoverishment over time can be directly related to the choices made and the interests currently dominant in agriculture and forestry. Local, basic needs were ignored as being not profitable. To recognise that urban agriculture cannot become commercial in the existing socio-economic context is vital. Urban agricultural science and technology cannot function in a 'historical' vacuum in social relations. Nor is it universal or valuefree. It has to be developed in each context with specific interests of urban poor in mind. The use/abuse model of agricultural science and technology is not relevant for urban agricultural development. From the very design/research phase, such a normative perspective is essential. Meeting the basic needs must become an important objective rather than growth, expansion and diversification. Hence the argument, that urban agriculture should not rely exclusively on the market for allocation of resources or distribution of output. The barriers to active promotion of agriculture lie among the present power structure of a city and the existing institutional mechanisms. Policy changes, education and organisation in the framework^{of} a political economy are needed for such promotion to be really effective.

The profound transformation in cities that is needed for such urban agriculture to succeed appears to be a formidable goal but I do believe that urban agriculture so practised can influence and shape the future of our cities where such transformation is indeed possible. The conflicts and trade offs in this approach are to be directly faced with resolutions attempted. The strategies that are described here are presented in the hope (para-phrasing Paulo Freire) that urban agriculture becomes a vehicle for the transformation of urban poor so that they can read their own reality and write their own future.

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