

**URBAN FOOD PRODUCTION
IN BANDUNG, INDONESIA:
CONSTRAINTS AND OPPORTUNITIES**

by

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ABSTRACT

Urban food production has many immediately observable, as well as long-term, benefits. It provides a means of self-help for the poor; is a stepping stone for urban environmental management; and is a productive, as well as aesthetic, use for open or marginal urban land. Yet it is an activity that is poorly understood; why, how, and to what extent, people engage in urban food production activities is only beginning to be researched. Certainly, in most cities in the world, this activity does not have institutional support. Lack of coordination of urban land uses and the ever increasing pace of development in urban areas, mean that urban food production, where it occurs, will become more and more difficult to sustain.

This study undertakes to expand the understanding of urban food production. Urban food production includes food growing activities carried out by urban dwellers within or on the periphery of the urban area, for distribution to, and consumption by, other, local, urban dwellers, or themselves. A literature review with examples from around the world presents the various roles urban food production plays. This review provides a context for the research, conducted in Bandung, Indonesia. Urban food production in Bandung is described through interviews and observation. Constraints and opportunities at the city system level and at the food producer level are identified. This investigation shows that with the current rate of development in Bandung, food production is becoming more difficult because of the increasing competition with other urban activities for resources such as water, air and land. However, many opportunities exist within the current framework of city management that can support food production within the city. This study makes a number of recommendations which can support and promote urban food production in Bandung.

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CHAPTER 1

Overview and Methodology

1.0 Introduction

Urban food production, a component of urban agriculture, can be a means of survival for the poor; an alternative for those who prefer some control over their food supply for nutrition and health reasons; and a resource for community development. However, in many cases this activity is either not recognized as a legitimate urban activity, or it is actively discouraged. Due to these perceptual and policy issues, the role of urban food production is poorly understood. Yet the reality is that food production within and on the periphery of the city continues to occur, and in some areas of the world, is increasing.

Urban food production can be defined as food growing activities carried out by urban dwellers within or on the periphery of the urban area, for distribution to, and consumption by, other (local) urban dwellers, or themselves. City management can decide to ignore this activity, which may lead to its elimination as urban land becomes more expensive. On the other hand, city management can recognize urban food production as an urban amenity which provides environmental, nutritional, economic, aesthetic, and social benefits. The support of urban food production entails integrating many aspects of urban and community planning such as urban land use and cost; citizen health; density levels; water and air quality; open space and parks planning.

1.1 Purpose of the study

The purpose of this research is twofold; first, to present a review of the literature on urban agriculture, focusing on, though not limited to, developing countries and second, to identify the constraints and opportunities for urban food production within the city of Bandung, Indonesia, where I spent three months in the summer of 1993, while affiliated with the

Planning Department at the Institute of Technology Bandung. The literature review will provide an understanding of the implications of urban agriculture for urban planning, discussing its environmental, social, and economic aspects. This research focuses on one of the components of urban agriculture—urban food production, a highly visible and easily accessible component of urban agriculture.

1.2 Objectives and structure of the study

In the first section, the literature review presents an overview of the role of urban agriculture, focusing on the research done in developing countries (Chapter 2). Next, the discussion on urban planning and food policy in Indonesia gives a context for the consideration of urban food production in the research (Chapter 3). The research on urban food production in Bandung meets two major objectives. First, in response to the need expressed in the literature for clearer definitions under the heading of urban agriculture, a definition and typology of urban food production in the context of Bandung is developed in Chapter 4. Second, the research identifies opportunities and constraints, as well as recommendations for food production in this urban area in Chapters 5 and 6.

1.3 Statement of the problem and rationale for research

Urban food production is a naturally occurring phenomenon in many countries of the world; however, it is an activity which is little understood. It has been cited as having many benefits, yet it is rarely supported at the city system level. This study undertakes to expand

the understanding of a component of urban agriculture¹, urban food production, within the context of Bandung, Indonesia. This research, through the identification of constraints and opportunities for urban food production in Bandung, presents recommendations which can be used by planners and others in city management, to support and promote this activity.

1.4 Methods of research

Food producers were interviewed in three neighbourhoods, all of which are within the municipal boundary of Bandung. The administrators of the neighbourhoods where these food producers live were also interviewed. Informal interviews were also conducted with people involved with food production in various areas of the city (including areas not covered in the formal interviews). Food sellers and distributors at the following markets—Pasar Gedebage, Pasar Caringen, Pasar Jamika, Pasar Sederhana, Pasar Baru—as well as on the streets, were interviewed and observed in order to gain a perspective on food distribution in Bandung. Individuals in planning or other areas of city management, as well as at different levels of government, whose work relates, either directly or indirectly, to urban food production, were also interviewed (formally and informally).

1. Interviewing

Interviews were conducted with key informants—those obviously involved in food production or recommended by the neighbourhood administrator as being knowledgeable. These individuals were formally interviewed in order to gain an understanding of their experience in food production, as well as an indication of the constraints and opportunities surrounding this activity. The neighbourhood administrators were interviewed for their perspective, as

¹A more detailed discussion of the definition of “urban agriculture”, of which food production is one component, appears in Chapter 2.

community leaders, on the issues surrounding food production and land use in the urban environment.

Several students at ITB volunteered to help conduct the interviews in Indonesian or Sundanese (the language of the local ethnic group). The interviewers followed interview guides² which covered a broad range of factors regarding the role of food production in these people's lives. The interview guides were needed since the interviews proceeded at a rapid pace, often through a two-way translation (Indonesian to Sundanese and back again); and interviewers tended not to be familiar with issues surrounding urban food production.³ The actual number of food producers interviewed formally was limited by my time in Bandung and by the availability of students to help conduct the interviews.

2. Analysis

Content analysis of the literature review highlights the relevant aspects of research on urban agriculture for planning purposes. Analysis of the primary and secondary research was carried out in order to identify the opportunities and constraints for urban food production in Bandung. These opportunities and constraints emerged from interviews with people with different points of view—from the producers, to community leaders, to local government. This qualitative analysis leads to a variety of recommendations directed at the institutions responsible for city planning and management.

² The interview guides were translated by a planning student at ITB into the Indonesian language (*Bahasa Indonesia*). Copies of the interview guides are available upon request.

³ This lack of familiarity with urban food production issues may be based on the perception that food production does not occur in the city (despite visible evidence throughout the city). Other challenges to this included: a lack of awareness of environmental issues; my limited knowledge of the language and culture; the difficulty of finding the opportune time to interview food producers and administrators; the weather (afternoon heat or rains make it difficult for anyone to travel); the amount of time needed to deal with bureaucratic necessities, such as visits to the immigration office and the obtaining of official letters of permission to conduct research.

1.5 Summary of research

Food production occurs in the city of Bandung almost anywhere there is vacant or open land; even managed parks contain fruit trees. The amount of food production varies according to the purpose and means of the producers; some use large amounts of land for market gardens, while others use small plots to supplement purchased food intake. With the current rate of development in the urban area, the larger pieces of land now used for food production within the urban area will disappear in the next 15 - 20 years. Smaller scale food production is also becoming more difficult because of the increasing competition of other urban activities for resources such as water, air and land. Given that urban food production provides many of the poorer residents with an extra source of income, or a source of food, and that it can, in addition, enhance urban environmental management, it is worthwhile considering whether this is the desired direction of urban development. Many opportunities exist within the current framework of city management that can support food production within the city. Coordinating efforts across the municipal departments of agriculture and environment, for example, can provide food producers with necessary information and inputs to continue and enhance food production. Policies and programs can be directed toward urban food production at different levels, and for different purposes, from a means of increasing household income to an aspect of environmental management.

CHAPTER 2

Literature Review of Urban Agriculture

2.0 Introduction

The focus of the research is urban food production, which is a component of urban agriculture. According to the literature, urban agriculture can play other roles such as a component of urban ecological management; a basis for alternative urban infrastructure; a survival strategy for the urban poor; and an urban amenity. Thus, urban food production is part of the system of urban agriculture, which interacts with the city system at many levels.

This review presents briefly the different aspects of urban agriculture discussed in the literature. The approaches taken to urban agriculture follow a similar pattern to the approaches taken in the literature on the urban environment (McCarney 1994, 1). That is, the literature tends to centre either around environmental issues, or economic and social issues, and the two are not well integrated. This may be due to the fact that the practice of urban agriculture is only recently becoming a field of its own, as well as to the tendency for researchers to approach the subject from their own discipline, when in reality the study of this activity requires a multidisciplinary approach.

The approach taken in this discussion is to review the problematic areas in the theory of urban agriculture, and to summarize the highlights of the environmental, social, and economic discussions. However, it is noted that, as with environmental problems, many of the reasons for, and issues surrounding, urban agriculture in the Third World are rooted in the current distribution of income and assets (McCarney 1994, 16), creating a different context than in developed countries. The important differences between urban agriculture practice in developed and developing countries deserve a more thorough exploration than there is room for here.

2.1 Definitions of urban agriculture

The statistics show that producing food in cities is not an isolated or rare phenomenon. Smit and Ratta, in their research on urban agriculture in 18 countries of Asia, Africa, and Latin America (1991-1992), found that "approximately 200 million urban dwellers globally are urban farmers, providing food and income to about 700 million persons. The percentage of urban families engaged in agriculture varies from five to ten percent in large cities in North America to 80 to 90 percent in Siberia and some smaller Asian cities" (1993, I.ii.3). Through an Urban Gardening Program run in 23 of the United States' largest cities, gardeners, including some of the nation's poorest residents, have been producing fresh food worth over \$16 million per year (Malakoff 1994, 4). Urban agriculture has been found to be "a powerful and sustainable tool for reducing hunger and poverty by providing the poor with the capacity to feed themselves and to generate income. It also improves the environment in low-income areas by converting idle and dirty spaces into a green, orderly and productive landscape" (Smit and Ratta 1992, 7).

Despite the significance and prevalence of urban agriculture, it remains a difficult task to attribute distinct characteristics to it; the literature is filled with calls to define urban agriculture more clearly. The various types need to be documented more thoroughly (Sawio 1993, 16), and a standardization of definitions and design for urban agriculture is needed in order to collect and compare quantitative data (Tinker 1993, 4). This kind of information is crucial to informing policy decisions regarding urban agriculture.

Definitions of urban agriculture tend to be comprehensive. For example, according to one definition, urban agriculture includes "any and all enterprises, commercial and non-commercial, related to the production, distribution, sale or other consumption of agricultural and horticultural produce or commodities in a metropolitan / major area" (Funches 1992,

133). Another definition states that urban agriculture includes the "food and fuel grown within the daily rhythm of the city or town, produced directly for the market and frequently processed and marketed by the farmers or their close associates" (Smit and Nasr 1992, 141).

Urban agricultural activities include planting, harvesting and marketing; using agricultural waste for composting and feeding animals; and recycling waste water for irrigation and animals (Smit and Ratta 1993). Other types of urban agriculture feature technology which enables intensive production, such as hydroponics and greenhouse growing. Products of urban agriculture, as they are most often found in developing countries, can include: aquaculture in tanks, ponds, rivers and coastal bays; livestock (particularly micro-livestock) raised in backyards, along roadsides, within utility rights-of-way, in poultry sheds and piggeries; orchards, including vineyards, street trees, and backyard trees; and vegetables and other crops grown on roof tops, in backyards, in vacant lots of industrial estates, along canals, on the grounds of institutions, on roadsides and in many suburban small farms (Smit and Nasr 1992, 141).

Another facet of urban agriculture is its ability to interact with many components within the urban setting. For example, urban agriculture is "an industrial system that converts the waste of other urban systems into jobs, food and fuel. It is an industry that removes pathogens and disease vectors from waste and pollution from the land, air and water that composes the living environment of the city. Finally, it puts idle land and surface water to productive use at low capital and maintenance cost, while improving the health of its practitioners and their clientele" (Smit and Ratta 1993, I.ii.5).

The permaculture literature places urban agriculture within a total design system. Permaculture design is "a system of assembling conceptual, material, and strategic components in a pattern which functions to benefit life in all its forms. It seeks to provide a

sustainable and secure place for living things on this earth" (Mollison 1990, 36). Key to permaculture design is its functional nature; every component of a design should function in many ways, and every function should be supported by many components (ibid., 36). Permaculture design includes the combination of diverse activities (gardening, farming, aquaculture, tree and shrub planting); recycling of all materials; high species diversity; minimum tillage; a layout minimizing walking and transportation; a close relationship between land usage and climatic features; and the location and design of buildings and their use. Thus, agriculture within the city is but one component of the ecological principles used for designing self-sustaining food, fibre, and energy producing ecosystems.

This research focuses on food production; however, this activity is always considered in the context of the urban agriculture system. The following definition of urban food production is the one used in this research. Food production activities in the urban area may take place on areas ranging in size from small plots used as gardens, to a number of hectares used for market gardening or growing staples. However, all these enterprises have in common these factors: they are run by urban dwellers who produce food, within or on the periphery of the urban area, for distribution to, and consumption by, other (local) urban dwellers, or themselves.

2.2 Defining "urban" in urban agriculture

A persistent issue in the definition of this term is where the urban area ends and the rural area begins. One option is to interpret "urban" agriculture to mean agricultural activities taking place within the legal boundaries (municipal boundaries) of the urban area. Not all areas within the urban boundary are characterized by the same density or built space, however. At the same time, municipal boundaries may be in flux. In some countries, for instance, it is not always (legally) clear where the municipal boundaries stop, and where the regional district begins. Another factor is the effect of growth in and around major centers; a factory or

institution may be established near a municipal boundary, and the growth surrounding it may cause an increase in urbanization that spills over into the non-municipal, non-urban area.

Another problem surfaces when attempting to define what is indicated by the term "urban". Some countries indicate urban regions through a statistical geographic definition, containing variables such as population and density. According to Indonesia's Central Bureau of Statistics (BPS 1988), a settlement can be classified as urban if it has: a population density of 5,000 persons per square kilometre or above; 24% or fewer agricultural households; and eight or more types of urban facilities (Firman 1992, 97). However, identifying urban agriculture exclusively with areas exhibiting these types of characteristics may exclude agriculture that occurs at the fringe of such a settlement. This agriculture can also be considered "urban", since it is oriented toward the urban market, and is impacted by urban effects (such as air and water pollution), or impacts the urban area, as much as agriculture within the city.

In addition to considering the parameters of the "urban area", the areas between urban centres may also need to be considered when discussing a definition of "urban agriculture". The rapid growth of cities, for example, engulfs existing villages where people continue to farm in the constricted surroundings (Tinker 1993, 3). In Asian countries, rapid growth is also occurring in the peri-urban regions and corridors connecting large cities (Firman 1992, 95). This pattern of development results in "desakota" zones (McGee 1991, 17), which are characterized by "an intense mixture of land use with agriculture, cottage industry, industrial estates, suburban developments, and other uses existing side by side," as well as by an "extreme fluidity and mobility of the population" (ibid., 17). This increase in the mixing of urban and rural activities and lifestyles means that food producers have access to a nearby market, but at the same time they must deal with the demand for space by competing uses. Agriculture production has adapted to the development of these zones; a general shift from a

monocrop grain production to an increased diversity with production in livestock, vegetables, and fruit has been observed (ibid., 17). The agriculture in the desakota area may be distinguished from urban agriculture by its more extensive distribution network; in contrast, urban food products stay within the metropolitan area.

The above discussion indicates that the "urban" in urban agriculture may emphasize the type of agricultural activity that takes place, rather than a certain density of population. Thus, "urban" agriculture takes place where there is metropolitan intensive agriculture, including horticulture, aquaculture, livestock and forestry which is oriented dominantly to the metropolitan, city or town market. This area may be designated as the "Metropolitan Geographic Zone" (Smit and Ratta 1993, 2.iii.7), where the rural-urban fringe becomes a flexible zone.

2.3 Locations of urban agriculture

In developing country cities, there are many land and water surfaces in the urbanized sphere that can be used for varying types of agriculture, which range from a complex home garden, to larger market gardens, to staple production. Areas of public vacant land within the city, used as a common property resource, are put under food production (Freeman 1991, 119). Areas within the city judged unsuitable for building, such as river valleys, flood plains, cliffs, quarries, under hydro lines, along railroads, are all places used for food growing (Tinker 1993, 4). In squatter settlements in these areas, land used for agriculture tends to be under intensive cultivation even if suitable conditions such as water and good soil are lacking (Douglas 1983, 21). In other cases, agricultural use of land is usufruct, occurring on land already allocated for another use, until that use is introduced by the city or developers (Smit and Ratta 1993, 2.iv.10-11). Agriculture also occurs on the periphery of the city; in wedges between distinct developments within the city; in idle water bodies; on household surfaces; and on community and private land.

The pattern of urban agriculture varies according to the history of the city. For example, in African and Asian colonial cities, where planning and infrastructure were introduced mostly in the residential areas of the urban elite, rural settlers developed houses and communities based on the design of their rural settlements (Hardoy et al. 1992, 139). In current urban development, the location of industry often determines patterns of settlement and agriculture.

2.4 Profile of urban agriculturists

Urban farmers are not from a homogeneous group; they include entrepreneurial, market-oriented farmers; survival, family, and community oriented farmers; and farmers running an agri-business. In their research, Smit and Ratta found that "farmers range all along the income scale, from small, individual farmers to large corporations. Few are organized, especially among the poorer farmers. Most do not see themselves as the part of a big picture of an urban agriculture industry" (1993, I.vi.15). Many who are involved in food production are women, who must feed their families or earn some money to do so. However, in many areas of the world, such as Indonesia, Mexico, and Central America, it has been found that most householders play special roles in house site food production (Brownrigg 1985, 116).

Urban agriculturists have different histories and abilities. Many are migrants who come from rural areas and begin producing food in the urban area as a way to supplement their income. In African countries for example, as the number of immigrants to cities increases and the formal economy is unable to absorb this labour, urban agriculture has become one of the important productive activities of the informal sector (Freeman 1991, 7, 120; Maxwell and Zziwa 1990, 2-3). In West Java, about 40% of the urban growth from 1971 - 1980 was due to rural-urban migration. (Urban Development Strategy [UDS] 1990, 1.2). These rural migrants bring agricultural skills with them to the urban setting. Others come from families which have been agriculturists for generations, and whose settlements have been surrounded

by the city as it spreads outward. Poverty is a motivator for some urban dwellers to learn agriculture skills in order to supplement their food supply or income source.

2.5 Role of urban agriculture

1. Regional contexts for urban agriculture

Consideration of the regional context adds to an understanding of the role that agriculture plays in different cities. In African cities, food growing in the past few decades has been actively pursued as different countries go through economic downturns, fraying of social systems, and environmental degradation. In an effort to cope with these devastating events, people are farming in varying scales within the urban areas, while earning incomes from a variety of formal and informal sources. In Asian cities people are continuing to farm as urban areas grow up around them, their culture orienting them toward household self-reliance. Thus, agriculture is maintained as a normal urban economic and environmental activity. Even poorer long-time urban residents may maintain a plot of land to provide them with a steady supply of staple foodstuffs. In China, cities administer their own food policies and planning; cities are designed with agricultural suburbs to supply the needs of the inhabitants (Hawkins 1982, 87; Hardoy et al. 1992, 139). In Latin American cities, which are the most European-like of the developing world, urban agriculture has been actively restricted by national and local governments. However, in the past few decades, in response to growing hunger and poverty in urban areas (due to debt crises and structural adjustment), NGOs are introducing urban agriculture projects, and some governments are introducing policies that support urban agriculture (Smit and Ratta 1992; *IDRC Reports* 1993). In European and North American cities, urban agriculture has played both a cultural and economic role, although urban development is continually displacing this activity.

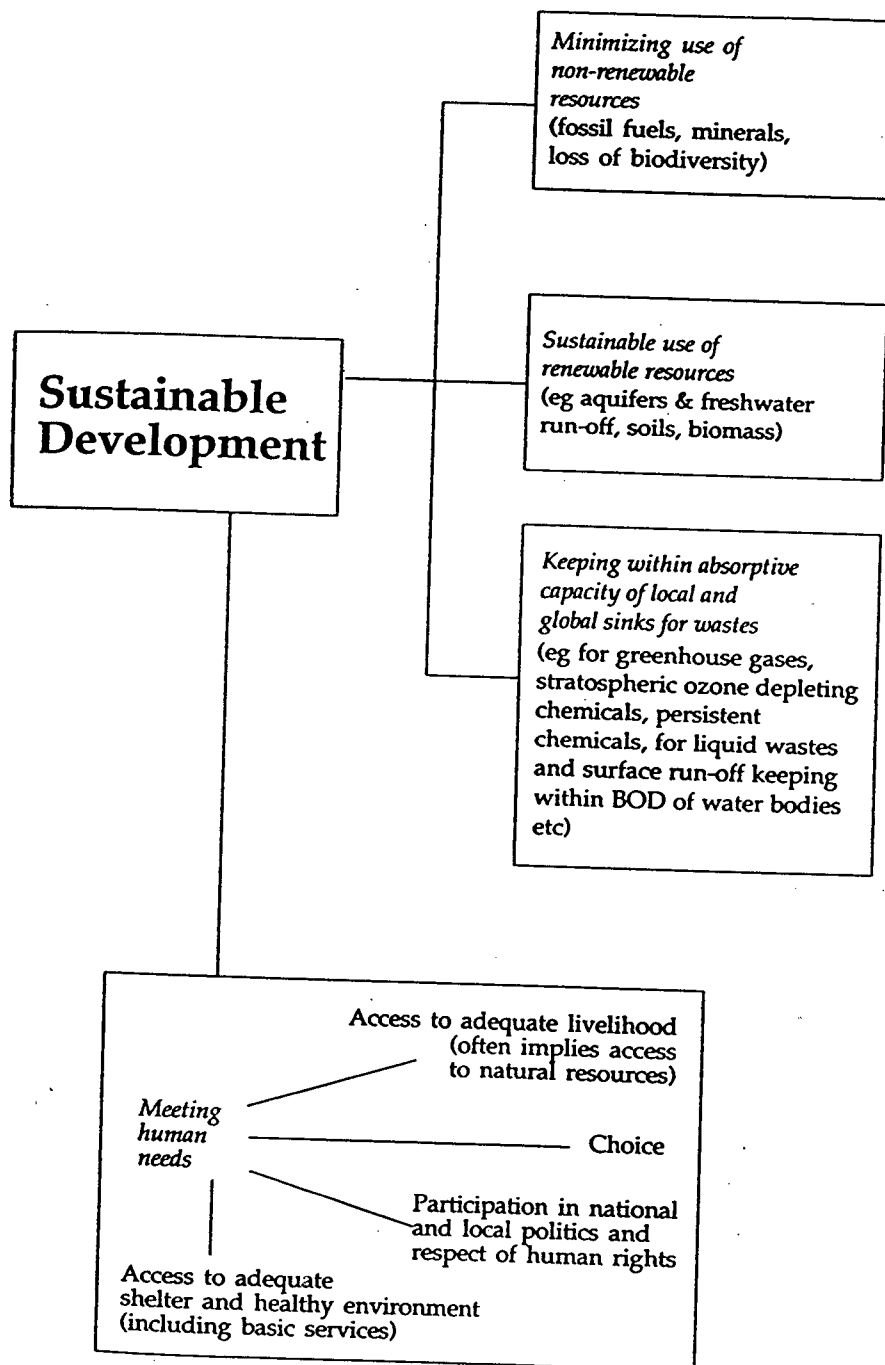
2. Urban agriculture and sustainable development

The industrialization of cities in the developed world in the first part of this century, and of cities in the developing world in the second part, is delegitimizing the presence of agriculture within the city, while also adversely affecting food production on the periphery, which tends to consist of prime agricultural land. First, urban agriculture has a tenuous existence because of competing demand for space. Second, as the urban area is built up around land used for industrial, commercial, and residential purposes, land values rise too much to allow this supposedly marginal, low-return activity to continue.

For cities in the developed world, issues of sustainability and carrying capacity are beginning to bring credit back to the idea of agricultural activity within the city. The growing understanding of the extent of the "urban ecological footprint" (Rees 1992, 124), or the actual amount of resources that urban dwellers consume, the rate of consumption, and the impact of that consumption on all parts of the globe, is beginning to provide a rationale for self-sufficiency activities such as urban agriculture. Given the scope of urban agriculture, it may be accurate to conclude that "sustainable development is 'unthinkable' without urban agriculture, given that more than half the global population will live in urban areas in a few decades" (Smit 1993, 17). Urban agriculture fulfills many of the goals of sustainable development. See Figure 1 for an illustration of the scope of sustainable development. While cities in developing countries, many of which have taken already industrialized cities as their model for development, have economic development as the primary goal, they too will need to consider the impacts of their ecological footprints and will need to cope with dwindling or damaged local resources. Thus, in the future, urban agriculture in developing countries which has been undertaken due to household need or cultural practice, may come to play an important role in the design of sustainable cities.

Figure 1. Components of Sustainable Development

(Source: Hardoy et al. 1992, 181)



3. Functions of urban agriculture

3.1 Environmental functions

Urban environmental management

The activity of urban agriculture, because it is a system involving many natural resources, provides an important venue for urban environmental management. The city, as well as being a physical structure, is an ecological entity—all the activities that occur within the city are part of an ecological system (Sachs 1984, 19). However, current city designs have tended to ignore the fact that the city is part of an ecosystem. City design, which has evolved as an open-loop system, causes resources to be used in a non-renewable way and the by-products are discarded (Smit and Nasr 1992, 141). Meanwhile, urban centres continue to grow, putting more stress on limited resources for services, facilities, infrastructure, energy, shelter, and food (World Resources Institute 1989, 42). Urban dwellers all over the world are now paying a high price for these designs which defy natural cycles (Lipkis 1992, 130).

Urban agriculture presents an opportunity to close the system loop within cities and enhance the urban eco-system (Smit and Nasr 1992, 141). It can be an active agent in transforming cities from "being only consumers of food and other agricultural products into important resource-conserving, health-improving, sustainable generators of these products" (Smit and Nasr 1992, 141). In the wider (regional and global) environmental context, urban agriculture can reduce dependency that occurs through the fully capitalized urban food systems, which are becoming increasingly globalized (Drakakis-Smith 1990, 114); help to reduce the further development of marginal, critical land for food production; and reduce the stress on transportation systems for bringing food to market. These benefits are due to the space conservation, compatible land usage (leading to alternative, more efficient cropping practices), and proximity to market.

Urban environmental management also provides a key link to self-reliance for urban dwellers, especially the poor, since "improving the capacity to manage the [urban] environment rests, first, on increasing people's access to key economic and environmental resources and, second, on empowering households and communities to participate as active decision-makers in the use and management of these resources" (Douglass 1992, 9). Access to these "strategic resources" (Brownrigg 1985, 125) for the poor has been assessed as the central problem in Java's, and Indonesia's, future (Schiller 1980, 93). The practice and support of urban agriculture can give the poorer urban dwellers access to resources, and the capacity to manage their own environment (Gutman 1992).

Urban land management

When land in the city is dedicated to the use of agriculture, it is productive, tended, and contributes to the aggregate of urban open, green space areas (which includes trees, parks, and flowering gardens) (Smit and Ratta 1993, 2.iii.c.8), and absorbs carbon dioxide and produces oxygen. Through adaptive design and planting, it can exert a modifying effect on the urban climate (Douglas 1983, 21), and help to control natural water flows. Urban agriculture, through this "unconscious greening" (McCarney 1994, 26), can contribute to environmental conservation within and around urban areas. Land under agriculture can also contribute to keeping a certain amount of land in the urban area open, helping to support the development of the legitimacy of urban open space (Quayle 1989, 26).

Urban infrastructure

Urban agriculture can provide alternative designs for physical infrastructure. It can contribute to urban waste management through the conservation and recycling principles inherent in its system (Hardoy et al. 1992, 141). For example, bioengineered systems, which can be an operational part of urban agriculture, can restore usable water to the environment, not just treat it, at a relatively low monetary cost (Roley 1992, 102). Alternative natural

sewage systems use marsh plants, such as cattails, hyacinths, reeds and rushes, as well as algae and soil microorganisms to absorb and digest effluents. These plants can also be harvested for feed and compost (ibid., 102). The design factors to eliminate potential health hazards and management concerns for graywater reuse systems include filtration, biological treatment, and some form of ecological disinfection (Roley 1992, 107). Blackwater, which is flushed down the toilet, can be biologically treated in a sewer, septic tank, or other ecological treatment system. This style of design can also support innovations in other areas of infrastructure, such as energy (use of solar and wind power), and transportation. (See Westley, Jokela, Woodhull, Hackelman, Walter, in *Sustainable Cities* (1992) for discussions of alternatives for urban transportation, infrastructure, energy, and waste management.)

Urban heating

Urban agriculture can help to counter urban heating, which occurs in large urban areas. The concrete covered area creates dry heat islands that quickly evaporate moisture. The dark surface areas (rooftops, pavement) and conductive materials in built-up areas act as a solar collector, which has a greater thermal storage capacity than surrounding rural and suburban areas. Urban areas can be 4-5 degrees warmer than the surrounding area in both summer and winter (Crenshaw 1992, 93). Green space in the tropical city can lower the temperature (since plants have a smaller heat storage capacity and keep ground temperatures lower), channel wind, insulate, create humidity in the dry season, and provide shade (Nieuwolt 1986, 527). This kind of green space can include landscaping around buildings, vines for building cover, windbreaks, park areas, trees along streets, and areas dedicated to food production. Golf courses, however, do not provide appropriate green space. Since they expose a great amount of open space at a similar level, transpiration occurs much more quickly, thus losing valuable moisture to the atmosphere.

3.2 Urban economic and social factors

Food security

Food security is surfacing as an increasingly important planning and development issue. Over the next 20 years, if food production keeps pace with the growth of the world population from 5300 million to a projected 7200 million, it will need to increase by 36%, just to maintain the present situation (WHO 1992;16). The location of this increase is significant for urban food production. It is predicted that during the last two decades of the twentieth century nearly half a billion people in the developing world will move from the country-side to cities. In 1975, only 28% of the world's population was urban; by the year 2000, urban residents will represent 50% of the global population, and this proportion will increase to 66% by 2025 (Pryer and Crook 1988, 1). By the year 2000, the world will have 79 cities with populations exceeding four million (mostly in the developing world), double the number in 1980 (Editor's note, *Ceres* 1987, 15).

With this increased stress on food resources, and with increasing numbers of urban poor, urban food growing may become a more wide-spread phenomenon. Research on food and nutrition in urban areas is showing that many urban dwellers are already extensively using the option of own-food production (Freeman 1991, Tinker 1993, Smit and Ratta 1993; *IDRC Urban Environmental Management Global Program Initiative Conference [URB-GPI] papers* 1993). Some researchers conclude that "the only long term solution to hunger is that people be able to produce food themselves" (George 1987).

Household economy

Own food growing by the poor frees scarce cash for other necessities, which is perhaps the most important economic argument for the existence of urban agriculture (Freeman 1991, 120). Food tends to play a large role in household budgeting, as reflected in the amount of food purchases. Research in cities around the world shows that the percentage of income

spent on food ranges from a third for the richest quartile to over 60 per cent for the poorest (Lowder 1986, 174). This difference exists even though wealthier people buy more expensive meat, more fresh fruit and vegetables, imported goods and alcoholic beverages, than poorer people, who tend to eat staple grains, roots, and the cheapest source of proteins.

Community economy

Urban agriculture can also increase the amount of disposable income available in the community by generating new sources of income. The International Food Policy Research Institute recommends urban agriculture as an activity which creates employment in production, processing, marketing, and other economic activities (von Braun et al. 1993, 37). Urban agriculture has been rated as the largest production industry in the informal sector (Smit and Nasr 1993, I.ii.5). At present, from the perspective of the urban economy in developing countries, urban agriculture is "part of the self-maintenance of the unemployed, removing from employers . . . [and] from the government the burden of maintaining this potential labour force in the city" (Freeman 1991, 119). Urban and peri-urban agriculture is frequently a source of employment for women (von Braun et al. 1993, 38; Smit and Ratta 1993, I.ii.5).

Nutrition in the urban area

The rate of urbanization in developing countries, and the speed of this change, has detrimental consequences on the health, economic and social development of the urban population, one of which is malnutrition (Pryer and Crook 1988, 1-2). Adding to the household food intake through own-food production can raise local nutritional levels (Drakakis-Smith 1990, 115), and can counter the effects of imported food, which, through packaging and processing, tends to be less nutritious (Britz 1981, 5). Recent studies are promising, indicating that "nutritional self-reliance, in the sense of an urban area producing

half or more of its nutritional requirements, is possible in all but the harshest climates, after consideration of land and water needs" (Smit and Nasr 1992, 147).

2.6 Barriers to urban agriculture practice

Despite the many functions and benefits of urban agriculture, there are many barriers to its development and support. A large barrier is an urban bias which causes a denial that this activity occurs, even though a "concerted look around most third world cities will find urban agriculture all over the place . . . fruit trees along streets, a backyard vegetable garden, trees for fuel and construction wood on slopes in low-density areas of the city, fish in ponds, a chicken farm inside an industrial district, a greenhouse behind a petrol station" (Smit and Ratta 1993, II.2.i.1). Despite the obvious existence of agriculture in the urban area, it remains unrecognized as a serious food production and survival method. If it is recognized, it may be only through regulations which are hostile to the production of food in urban areas, such as the municipal bylaws in Kampala, Uganda, dating from the colonial era, which ban cultivation in the city, except for small vegetable gardens and flowers (Lee 1993, 11).

The lack of access to resources such as land, agricultural inputs, and information is a large barrier to urban agriculture. Examining the state of the poor around the world reveals that "in most countries, people have the resources to feed themselves; they just don't have access to these resources" (Moore Lappé 1987).

Cultural issues are behind some of the lack of support for urban agriculture. In many areas of the world it is taboo to irrigate with soiled water—the perception is that it will contaminate (either literally or figuratively), and should not be used for aquaculture or for irrigating crops. Another significant cultural barrier is the perception that producing food is a "poor man's" activity. Research has shown that those who have an assured source of cash income tend to

spend less time in subsistence activities, compared to those whose income source is unstable (Evers 1981, 24).

Cultural barriers also prevent the development of appropriate technology for urban agriculture. For example, urban gardening projects in developing countries often fail to meet their goals because of incorrect assumptions, such as that gardening was unknown in the target areas, that indigenous plantings were of little nutritional value, and that "developed country" model gardens were needed and could easily be transferred (Ninez 1986, 34). Although one of the aims of the projects may be to improve nutritional status, studies of existing nutrition and eating patterns are hardly ever done. The projects that fail are often overly ambitious, and not directly related to family food production. The groups and technology established to create and tend the gardens often remain alien to community social structure (ibid., 34). These factors make it difficult for a successful transfer of gardening technology to the household level to take place.

Health barriers pose a significant problem for the support of urban agriculture. For instance, using waste water for irrigating urban agriculture can be problematic when the water source is industry, or when the waste water carries pathogens and vectors. However, these can be dealt with in various ways, from biologically treating the water to remove the pathogens sufficiently so that it can be used for irrigation, to choosing crops less susceptible to contamination (Smit and Nasr 1992, 144). Natural pesticides and fertilizers can be used to minimize health risks from these sources.

The effect of urban pollution on plants and animals poses a risk to health. For instance, food grown next to roads may pick up heavy metals (present due to air pollution) through the soil. Air pollution can also affect yields and natural resistance to pests (Hardoy et al. 1992, 117-8). However, lack of research limits the knowledge available about the impacts of pollution,

especially on non-commercial plants grown by home gardeners in tropical areas (Wade 1986, 11). According to research done in the United States, greens such as lettuce, spinach, kale, tend to accumulate lead and cadmium, and should be planted furthest from streets. Fruit and vegetables such as tomatoes, eggplants, melons, peppers, beans, peas and tree fruits show lowest concentrations of heavy metals. They can be planted closer to the street, though preferably not closer than 7.5 meters (ibid., 11). Through methods such as crop selection; use of organic matter (in order to keep soil pH at a high enough level to prevent lead and cadmium uptake by plant roots); peeling of root crops before consumption; washing food with diluted vinegar (to remove air-borne lead); planting a barrier crop, such as trees and cassava, the impacts of pollution from urban sources can be lessened (ibid., 11).

Significant factors in the limited applications of urban agriculture is the lack of information, political will and financing. For example, the barriers to using the available technology for waste water lie largely in the lack of information, such as data to assess the risks associated with gray water use. Other limitations are the absence of legislation or regulation regarding graywater, and little experience with water reclamation systems (such as irrigation, septic systems subsurface drip system, mulching, composting, alternatives to lawns) (Roley 1992, 107). As a result of these barriers, the information base is so limited that either this activity is not supported at all, or the policies and programs that are designed are often based on speculation (Smit and Nasr 1992, 147; Drakakis-Smith 1990, 114).

2.7 Issues seldom addressed by urban agriculture literature

A number of important issues are not often addressed by the urban agriculture literature. The ecodevelopment literature does not adequately describe the connection between theory and practice, so that it is difficult to assess practical applications, such as urban agriculture. The socio-economic and geographic literature tends does not focus on the long-term costs and benefits of urban agriculture. Benefits, for example, might include valuable factors such as

the preservation of urban open space, or a way of holding land while tenure is unclear. There is a lack of emphasis on the cultural context, an important consideration in the support of urban agriculture activities. There is a lack of literature on practical applications and innovations for urban agriculture in developing countries. Technical discussions on other aspects of urban agriculture for developing countries, such as waste and water management, are also sparse. Factors of scale of implementation and time frame are not easy to assess. For waste water, for example, the conversion from the 19th century "disposal system" to a 21st century "reuse system" may take a generation, being phased in over the useful life of the old system or according to the capacity of urban agriculture to absorb it (Smit and Nasr 1992, 145). There is a tendency to perceive urban agriculture as a way for only the poor to manage food security and environmental issues, when, in reality, this might be a more widely adopted option as these issues are becoming more common across socio-economic classes.

The literature supporting urban agriculture does not often address the effects of the urban micro-climate on growing gardens or crops in the city. Specifically, little research is available for food growing in tropical cities concerning such issues as the effects of pollution or acid rain on plants, or the effects of chemical inputs on soil and ground water. Most studies regarding urban heating to date have been conducted in mid-latitude cities; tropical urban climatology, and its effect on vegetation, is a new area of research (Jauregui 1986, 41).

2.8 Conclusion: implications of urban agriculture for urban planning

A large limiting factor for the integration of urban agriculture into the planning of cities is the current attitude that it is relevant only as a survival strategy for marginalized groups, and that it entails health risks and environmental problems. These attitudes are reflected in the current lack of services to urban agriculture, such as credit, extension, and other supports (IDRC URB-GPI Conference 1993).

However, urban agriculture, which interacts at many levels with the city system, provides benefits and innovations for urban planning. From the environmental planning perspective, urban agriculture can provide an alternative planning model based on ecological principles. From the economic and social perspective, urban agriculture enables community development, household self-reliance, and supports urban food security. It can provide a way to manage urban growth that promotes a minimal use of urban capital while meeting social and economic goals (Hardoy et al. 1992, 190). Given its numerous positive features, urban areas can benefit from planning for urban agriculture; indeed, it should "not be allowed to evolve by happenstance and serendipity as has happened in other aspects of urban development" (Funches 1992, 135). Policy measures at the level of urban and peri-urban planning can improve the subsistence base and the appearance of the rapidly expanding cities of the developing world (Brownrigg 1985, 126). These kinds of policies, since they implicate resources across administrative boundaries, bring an additional benefit of planning for the urban area in a regional context.

The importance of urban agriculture as a source of income or food, and the scale and diversity of food production in many countries is under-estimated (Hardoy et al. 1992, 139). There is a "need to address linkages between urban agriculture as an informal sector activity and other urban processes such as community action, health, nutrition, gender, education, and the overall issue of poverty" (Sawio 1993, 16). Research is needed to identify the constraints and bottlenecks for urban agriculture, such as those related to gender roles, ethnic prejudices, lack of understanding of linkages between food, fuel, and energy needs, negative cultural attitudes, and urban bias (IDRC URB-GPI Conference 1993). Continued research is also needed to determine the role of urban agriculture in providing food security and in urban environmental management.

CHAPTER 3

Indonesia's Growth and Food Production

3.0 Introduction

Examining urban food production in the context of a country's urban and economic development helps to understand the issues in the local, urban context. Urban food production in Indonesia is impacted by developments at the national level in the following areas, which are discussed in this chapter: urban growth; economic growth; food supply and demand structures; environmental priorities; and land use patterns.

3.1 Urban development patterns

A review of the development of urban areas in Indonesia shows that food production even in densely populated settlements was common practice from the time that cities began to grow, which, for Java, was in the 14th century (Nagtegaal 1993, 52). Although rice fields were situated on the periphery of settlements, vegetable and fruit production were associated with household and common areas (Baks 1988, 217-18). The early cities were collections of separate *kampungs* (settlement oriented toward a particular neighbourhood) where the inhabitants lived in conditions similar to those in rural areas (Nagtegaal 1993, 53). As the settlements grew outward, they subsumed the rural pockets associated with the *kampung* and with the *desa* (village) (Baks 1988, 216), leaving rice fields and forests in the middle of heavily populated areas.

As the population grows and density increases in the present era of modernization, urban development is rapidly changing the nature of these settlements. Since the population is concentrated in areas of fertile land and areas of economic opportunity, roughly 100 million

of Indonesia's 185 million live on only seven per cent of the archipelago's land; the density of the island of Java alone is 800 people per square kilometre (McClellan 1992, 134). Increasingly, these people are living in urban rather than rural areas. With the trend of a quickly growing, semi-urbanized population settling in metropolitan areas, Java may become an island city by the year 2000 (Baks 1988, 223). This rapid rate of growth in Indonesian cities is accompanied by urbanization problems experienced by many cities in the world, including the fragmentation of land; unplanned and uncontrolled human settlement development; increasing speculation on fertile urban land; and rapid population growth which puts a high demand on declining urban services (Akbar 1991, 15).

The socio-economic structure is such that a majority of urban (as well as rural) households still earn their living in the informal sector, in the kinds of work found in both city and village. Many of these people have little access to linkages to the full "benefits" of "urban opportunities" because of lack of finances, education, and connections (Baks 1988, 221).

The extent of the informal sector, which includes manufacturing activities, provision of urban services, as well as the cultivation and marketing of agricultural produce, although prevalent, is not well understood (Hainsworth 1992, 68-9). One of the problems with surveying in the informal sector is that it is difficult to classify individuals or households by their main economic activity, since the "combination of incomes from the formal, informal, and subsistence sectors, and the change in these combinations with the domestic development cycles, is the most characteristic feature of the urban household economy" (Evers 1981, 23). Urban food production, a long-time feature of settlements in Indonesia, is one of the little understood sources of income, or income supplement, for urban residents living within the informal sector.

With current trends in regional development, such as ribbon development along the corridors, food production in rural areas is also being impacted by urbanization, as urban activities and land uses spill out into the still rural areas. On Java, for example, urban population growth during 1980 - 1990 created a giant corridor which now stretches all along the north coast of Java (where many of the economic activities occur), from Jakarta to Semarang through Cirebon. Similar growth corridors are developing between Jakarta-Bogor, Surabaya-Malang, and Semarang-Yogyakarta (Firman 1992, 104). This means that even rural farmers need to think of food production in terms of urban spatial organization and urban effects on food growing activities. For those who formerly practiced only subsistence food production, agricultural activities may increase or decrease with these trends, depending on availability of land and capital, security of tenure, and the availability of alternative sources of income.

3.2 Economic growth

In the 1970s, the Indonesian economy grew at an average annual rate of 7.2%, and fell to 3.6% after the 1983 oil crisis (Thorbecke 1991, 1600). During the mid-eighties, a structural readjustment program was begun, involving exchange rate management, as well as fiscal, monetary, and financial policy reforms, which brought the growth rate to an estimated 6.8% (Hill 1992, 4). As a result of this adjustment program, the incidence of poverty was found to be significantly lower in both urban and rural areas in 1987 than in 1984. The proportion of population below poverty line fell from 33% in 1984 to slightly over 20% in 1987. In terms of consumption, income, and caloric intake, every percentile of the distributions was better off in 1987 than in 1984 (Thorbecke 1991, 1601).

The share of agriculture in GDP declined from 40.7% in 1970-74 to 29.8% in 1981-83. In employment, agriculture's share fell from about 64% in 1971 to about 55% in 1982, while all other sectors gained in relative terms (Thorbecke 1991, 1596). In the most recent years, manufactured exported goods have generated much economic growth. In 1991, for the first

time in the nation's history, manufacturing output exceeded that of agriculture. In fact, the share of manufacturing in GDP has risen from 8% to 22%, while that of agriculture has declined from 51% to 19% (Hill 1992, 6).

In Indonesia, as elsewhere in the world, industry is now expected to grow at the expense of agriculture, both in terms of contribution to GDP and in terms of its share of national employment (Hainsworth 1992, 59). Indonesia, which faces the challenge of creating three million new jobs a year for its population, finds itself in the position that "it has no choice but to develop at almost any cost" (Stackhouse 1994, A9).

Indonesia's current dominant economic goal, as stated in the latest five year development plan, is to build the potential for fast growth in industrial development, so that Indonesia can become a modern industrial state in the 21st century (Hainsworth 1992, 63). At the same time, with oil prices dropping, agriculture and other resource-based exports (including estate crops, livestock, forestry) are the sectors that will be used to generate larger shares of government revenue and foreign exchange earnings (*ibid.*, 64).

The impacts of an accelerated rate of growth can be seen in the current urban structure. As Indonesia modernizes, urban and peripheral land under food production is rapidly disappearing. Urban land is being dedicated to the manufacturing sector, and the surrounding rural land is being used for industrial development. The growth in population and in economy is also increasing the pressure on infrastructure and residential areas to expand, absorbing additional resources and land. Another major concern is the persistence of poverty, which is widespread in many Southeast Asian cities. From a policy perspective, in order to deal adequately with these problems, it has been recommended that planning expectations and methods need to be revised, and that economic growth for its own sake must be avoided (Yeung 1990, 142).

3.3 Food supply and demand

Indonesia's rapid economic growth and structural change during these years influenced the demand for food. In Indonesia, between 1970 and 1985, real per capita incomes increased by 120%, while the level of urbanization increased from 17.5% to 26.2% of the total population. During this period of rapid income growth and urbanization, the total population increased from 117 million to 164 million persons (Tabor et al. 1989, 32). A conservative estimate of current population is 180 million (*Indonesia Magazine* 1990, 38). The urban population of 52 million in 1990 (28.8% of the population) will grow to an estimated 132 million (52.2% of the population) in 2020 (Streetfood Project 1992, 59). The rise in population has been accompanied by a fall in birth and death rates which has led to an increase in the share of the adult-aged group in the total population.

This rapid rate of growth has been met by the Indonesian government's food policies in its Five Year Plans. "Self-sufficiency" in basic staples has been a policy concern for the kingdoms within the islands, and subsequently of the nation of Indonesia, for several centuries (Mears 1984, 122). However, after independence (1945), this concept began to be conceived more specifically in terms of food self-sufficiency, particularly in rice. Government policies and strategies during the 1970s, accompanied by the technology of the Green Revolution, made it possible for Indonesia to move from being the largest rice importing country in the world to virtual self-sufficiency in the mid-1980s (*ibid.*, 131).

In order to reach the goal of rice self-sufficiency, BULOG (*Badan Urusan Logistik*), a national food logistics agency was introduced in 1967. BULOG's mandate is to guarantee that "certain basic foodstuffs are available to every citizen of Indonesia at reasonable prices, without causing too much pressure on all parties involved, including the farmer, the trader, and the consumer" (*Indonesia Magazine* 1990, 39). The list of basic food commodities

includes: rice, sugar, maize, wheat and wheat flour, soya beans, mung beans, fish meal, beef, chicken, eggs, and palm oil. Vegetables, which are priced by the market, remain affordable.

Under its mandate, BULOG is responsible for supporting a floor price paid to farmers for rice, as well as for setting a ceiling price to protect the consumer. During the Green Revolution, BULOG was used to support the agricultural policy of reducing rice imports and keeping urban food prices down (in order to keep money wages and inflation down), by enforcing the compulsory use of high yield variety seeds (HYVs), by controlling planting cycles and rice marketing, and by endorsing other strategies which ensured close control over farm production (Hainsworth 1992, 63). BULOG's role is seen as essential to national food security because of the country's geographic structure and natural conditions (*Indonesia Magazine* 1990, 40). Indonesia is comprised of over 13,600 islands; rice as well as other basic foodstuffs cannot be cultivated on many of them.

Other strategies used during Five Year Plans from 1951 to the 1980s to increase rice and other food production included: irrigation rehabilitation; newly developed varieties of rice and corn; a cooperative movement to supply inputs (fertilizer, seed and credit); developing an extension service to communicate expertise; increasing organizational capacity; intensification programs; and using foreign suppliers to overcome fertilizer, seed supply and mass distribution difficulties (*Indonesia Magazine* 1990; Mears 1984).

As population and personal incomes grow and change, the production level required for national self-sufficiency in rice constantly rises. Research shows that consumers attempt to increase the quality of the staple diet as incomes rise. In Indonesia this includes increasing the amount of rice consumption (Tabor et al. 1989, 32). However, less and less land is available to support the increasing population with food. Other difficulties in maintaining the growth in rice supply include: diminishing returns from fertilizer inputs, increasingly

frequent pest outbreaks, dependence on rainfall to supplement irrigation supplies, and limited success in breeding higher yielding rice varieties (ibid., 43). In addition, as the population grows, the current infrastructure supporting affordable food, and supporting the policy of self-sufficiency in rice, needs to be maintained and improved (for instance, increased storage space, better access to credit for farmers). Elsewhere in the economy, increasing amounts of foreign earnings through the development of other sectors may allow an increase in food imports, which tend to be priced much differently than food grown within the country.

At the city level, residents may provide themselves with food from outside of the mainstream food supply system. Research in quickly urbanizing areas in Indonesia has shown that poorer urban dwellers are providing for some of their basic needs, including food, through a non-cash system. In a study on the contribution of subsistence production⁴ to the urban economy in Jakarta, Evers found that for 34.5% of all householders (over 5,000) in the study, subsistence production contributes more than 20% of the household budget. In the case of one sub-sector interviewed, 14.7% of food consumption was derived from subsistence production (Evers 1981, 19, 23). Own-food production can play an important role in the day to day survival of a significant number of urban residents.

3.4 Environmental priorities

The policy of rice intensification through industrial agriculture strategies in Indonesia is being criticized for its accompanying environmental damage (Hainsworth 1992; White 1989; Schiller 1980). At the market side of the loop, the commodity prices of industrial agriculture do not usually include full environmental costs, social costs, or costs to future generations (Hainsworth 1992, 67; World Resources Institute 1989, 54).

⁴ Subsistence production includes a host of activities which contribute to household consumption, which are not mediated by any market, and do not involve cash payments (Evers 1990, 16). "Subsistence food production", a term used later in this document, is defined according to the stated parameters.

The spraying and dusting of rice, for instance, is needed regularly (at 10 - 14 day intervals). Since new early maturing, high yielding varieties can now be grown continually on irrigated land, application rates can occur from 10 to 20 times a year. Pesticide application for cabbages is required every three or four days (Barbier 1989, 884). However, this kind of intense pesticide application can result in the development of strains of pesticide-resistant insects, to which the response is an even more intense application of pesticides. Applications of these chemicals affect other life within the food ecosystem, such as fish stocks in irrigated rice paddies, irrigation channels, and ponds, which have been greatly reduced by pesticide poisoning (ibid., 884). Further impacts of the industrial approach to agriculture include soil degradation and groundwater pollution from intensive use of chemicals for fertilizers (for both rice and vegetable crops); loss of top soil and siltation of canals, reservoirs and coastal zones; destruction of mangrove swamps, coral reefs, riverine and coastal fish hatcheries (Hainsworth 1992, Barbier 1989).

3.5 Land management

Investment patterns make it difficult to keep good agricultural land. The early five-year development programs of the New Order government emphasized increasing agricultural output; this policy made rural land more productive and increased its value (Lucas 1992, 84). Although absentee land ownership is illegal, good agricultural land is being bought up by the urban middle class, for investment, and in some cases, for later development. As in other areas of Southeast Asia, there has been a large increase in speculation on urban land, causing urban land values to rise quickly (Yeung 1990, 157). At the same time, urban land is becoming "too valuable" to keep in use for food production (Lucas 1992, 85). The popular view is that agricultural land in and around urban areas must be sacrificed for the development of industry, technology, and new housing developments.

Lack or loss of tenure through these processes means that land used for food production is not secure. There is a point of view which holds that a reform of land policy is not crucial to the development of a sustainable agriculture in Indonesia; according to this view, ecological and economic factors are the main obstacles to an assured supply of food, not issues of land control, which have always been problematic in Indonesia (White 1989, 79). However, issues of tenure do seem crucial to introducing changes in food growing practices, whether for subsistence or market production. Although a registration process has been made mandatory under law, the cost and bureaucratic problems involved have proved prohibitive to registering land. If land is not registered, the only proof of ownership or cultivation rights is length of time the landholders have been cultivating land, and the record of the payment of their financial obligations. In any case, subsequent regulations have allowed the government to expropriate land against landholders' wishes, even if they have certificate of rights. Without tenure, and with an increasingly diversified economy, there would seem to be little incentive for a food producer to invest in better ecological practices.

Tenure is also lost through development. Through the Basic Agrarian Law of 1960, which makes the State, on behalf of the citizens of Indonesia, responsible for the management of land, water, air, all natural resources, and land use planning and zoning, the State withholds for itself the power to revoke an individual's rights to land, with the payment of compensation, if the land should be needed for the public interest (UDS 1990, 5.4). However, the provision of land for development for the public interest has encouraged development without protecting the rights of the economically weak. It is common practice for local governments, for instance, to allow communal land to be sold to a developer. The people who use the land tend to be informed only afterward of the deal, and of the compensation package, which is often less than adequate (Lucas 1992, 84; Darin-Drabkin 1977, 414-15).

3.6 Conclusion

Many of the above impacts on urban food production are beyond the control of local government. These factors do show, however, the benefits of this activity, which has long been a practice in the Indonesian urban setting. The food production observed in Bandung can be seen as an extension of the traditional home gardens and cultivation systems found in rural areas in Indonesia (Stoller 1978; Anderson 1986). These systems, which feature the efficient, sustainable use of land characteristic of Asian cultivation techniques (Bray 1994, 34-5; Stoller 1978, 88; Barbier 1989, 884; Hainsworth 1992, 65) can be found in the urban setting in part as a response to the factors of limited space and degraded soils. From a policy perspective for Southeast Asia, the production of food in major urban centres has been recommended as part of an alternative urban strategy (Yeung 1990, 161), a concept which could be applied in Indonesia. At the same time, the current potential challenges to national food security in Indonesia may encourage people to grow more of their own food, at least more of their own non-staple foods, when and where they can. These current trends make it worthwhile to explore means of supporting urban food production at the local level.

CHAPTER 4

Description of Food Production in Bandung

4.0 Introduction

Food production can be found throughout the city of Bandung, carried out at various scales, and for varied purposes. Interviews and observations provide information for a typology of food production in Bandung, as well as for an assessment grid for designing policy regarding this activity. A brief description of Bandung's location, governance and planning, and economy are given as a background for food production activities.

4.1 Background for food production in Bandung

The city of Bandung is on the edge of a plateau at an elevation of about 700 metres, and is surrounded on three sides by volcanic mountain ranges which reach more than 2,000 metres above sea level. To the north and south lie the volcanic peaks, while to the west lies a ridge of hills. The city covers two different topographical areas: the southern half is on the plateau, while the northern part lies on hills that lead toward the adjacent town of Lembang. The plateau, approximately 40 kilometres long and 15 kilometres wide, is drained by the Citarum River which flows from east to west across the southern part. The rest of Bandung is drained by many other rivers, most of which flow from north to south, forming long and narrow streams that join the Citarum River (Akbar and Pribadi 1992, 123) (see Figure 2).

Following a traditional Javanese settlement structure, the distribution of land uses in Bandung is concentric. Surrounding the city square (*alun-alun*) and institutional buildings is a well developed commercial area, now referred to as the Central Business District.

(Source: UDS 1990, E.2)



Current distribution of land uses shows the impact of planning from colonial times, which effectively divided Bandung into two social spaces (Akbar 1991, 51). The Dutch settled in the north, developing estates and institutions, with the complementary infrastructure, while the settlement of local population continued mainly in the south of the city. Today, the industrial activities are located mostly in the western and southern parts of the city, and the institutional activities are situated mostly in the north and eastern parts. Over the past ten years the city has grown rapidly toward the east and south. Current focal points of rapid development are the Central Business District, the residential developments in the northwest and northeast, and the quickly growing development of public and private institutions along the Soekarno-Hatta Road. Smaller retail and business centres exist in different areas around the city centre. Local government is trying to encourage the shifting of focus (for markets, business, etc.) to these centres (interview, BAPPEDA director). However, the tendency persists for residential, as well as other land uses, to agglomerate around a "single" city centre.

The *Kotamadya* (municipality) of Bandung is situated geographically within the *Kabupaten* (regency, or regional district) of the Bandung metropolitan area, also referred to as Bandung *Raya* ("Greater Bandung"). The municipality of Bandung, which is the capital of the province of West Java, is the dominating metropolis in this area, and is surrounded by much smaller urban centres along arterial roads leading towards it. The municipality and regency border a growing mega urban regional area identified as "Jabotabek", which connotes the area encompassing Jakarta, Bogor, Tangerang, and Bekasi (see Figure 3). Bandung itself is increasingly being referred to part of as the Bandung Metropolitan Area, which includes both the municipality and parts of the regency, for economic development and spatial planning purposes (see Figure 4).

The municipality of Bandung's current population of 2,653,000 (Akbar and Pribadi 1992, 129), occupies about 60% (in residential areas of approximately 9964 ha) of the city's 16,606 hectares⁵, with an average density of 266 people per hectare. This density, however, ranges from 1000 people per hectare in the more crowded areas of the city (for instance, in the south), to 100 people per hectare in the outer areas of the city. Bandung is also the centre for residential areas adjacent to Bandung's administrative area, which, in effect, are also part of Bandung's "urban area" (ibid., 133; Akbar 1991, 87). Also associated with the "urban area", though not within the administrative boundaries, are the economic and industrial developments which have spilled over onto land adjacent to the city.

Bandung's economy is shifting toward industry and manufacturing (textiles, garments, metal products, and more), as well as secondary and primary service activities (Akbar and Pribadi 1992, 127), following the trend of moving away from agriculturally-based employment which is occurring in most parts of Java. The increase of employment in these sectors, as well as the large number of educational institutions, draws people from all over Indonesia to this city. Those who cannot find employment join the "informal" sector, which includes food production and distribution activities, in order to survive (ibid., 128).

⁵In 1989, 8,508 ha was transferred from the jurisdiction of the regency to the municipality. Bandung's total administrative area, which had been 8,098 ha since 1951, now totals 16,606 ha (Akbar and Pribadi 1992, 132).

Figure 3. Jakarta-Bandung Mega Urban Region

(Source: Akbar and Kombaitan 1993)

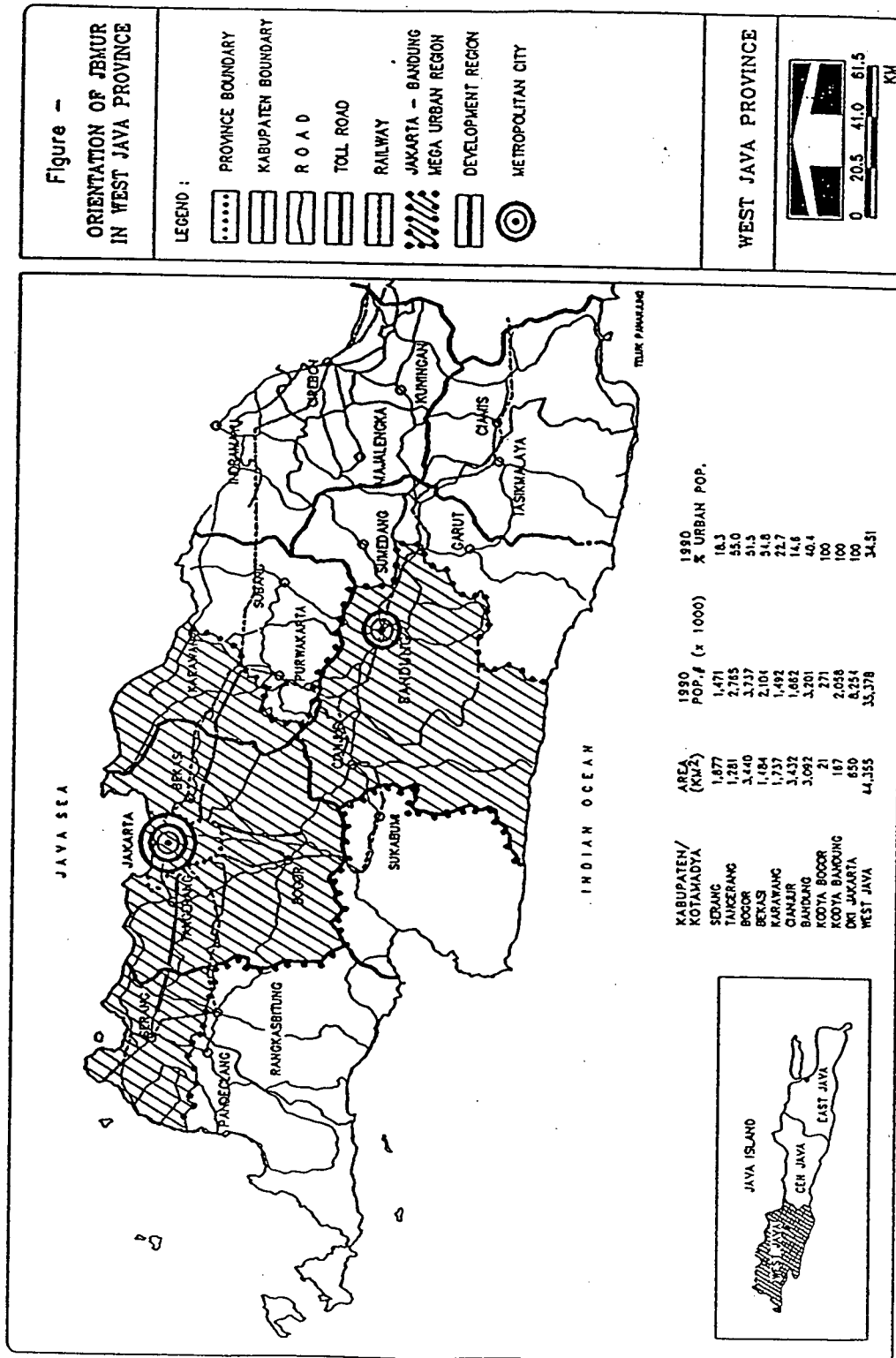
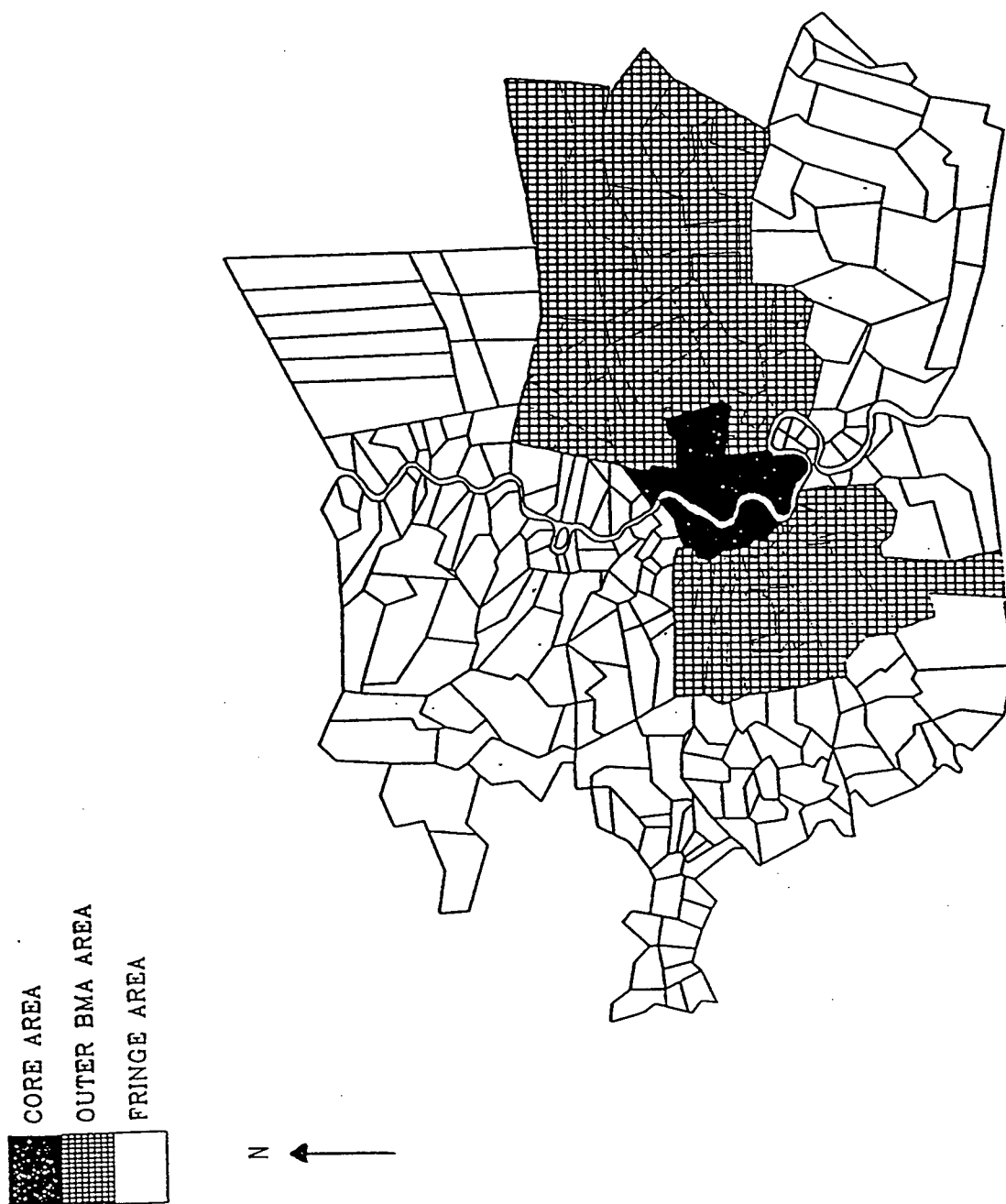


Figure 4. Bandung Metropolitan Area

The Bandung Metropolitan Area consists of the municipality of Bandung and areas within the regency whose activities are closely connected with Bandung.
(Source: Akbar and Kombaitan 1993)



4.2 Nutrition levels in West Java

Calculations of nutritional adequacy for West Java give an indication of the average level of level of nutrition that may be found in Bandung. Average calorie intake for urban residents in the province of West Java has increased from 1,683 in 1984, to 1,780 in 1987, and reached 1,800 in 1990. The average protein intake for urban residents for the corresponding years has increased in grams from 43 to 45 to 46. The intake of calories and protein from combined food sources for 1990 is calculated as being 1,984 calories and 50 grams of protein. At the same time, average calorie intake for rural residents in the province of West Java has increased in the same years in calories from 1,891 to 1,937 to 2,021, and in protein from 46 to 48 grams; the intake of calories and protein from combined food sources for 1990 is calculated at 2,128 calories and protein at 51 grams (*Konsumsi Kalori Dan Protein Penduduk Indonesia Dan Propinsi 1990*, 48-9; 104-5; 24-5). The FAO recommended nutritive requirements are 2,200 calories per day, and 50 - 70 grams of protein per day (Pierce 1990, 44, 46); the standard set by the Indonesian Ministry of Agriculture is 2,000 calories, and 45 grams of protein, per day (*Konsumsi Kalori Dan Protein Penduduk Indonesia Dan Propinsi 1990*, 23).

4.3 Jurisdiction of food production activities

Both the municipality and regency of Bandung have agricultural departments. The municipal Agriculture Department collects information about crop production levels, amount of land under different types of cultivation, the number of people classified as "farmers" within the municipality, and the amount of income food production brings. The Agriculture Department delivers some extension services to these urban area farmers through the farmers' cooperatives that exist within each *kecamatan* (local administrative unit).

The Agriculture Department also takes part in the local promotion of the national urban greening program, in conjunction with the Parks Department. Through this program, which promotes the planting of trees, shrubs and flowers along streets, riverbanks, along roads, by offices and industrial buildings, in people's yards, and other unoccupied land, the government provides seedlings free of charge to people who will plant them and take care of them. Evidence of earlier government sponsored garden programs, targeted toward housewives from low income groups, such as the *warung hidup* (living *warung*, or food stall), and the *apotik hidup* (living dispensary, for medicinal plants) still exist.

4.4 Who is involved in food production?

Food producers within the city of Bandung include market gardeners, farmers (growing vegetables, rice and fruit, as well as various meat sources for the market), subsistence producers (who grow just enough food to feed the household), gardeners (who have a small plot of land used to grow some part of the diet), and others; these various types are described in more detail in the following sections. In addition, many people, who may work either in the informal or formal sector, have gardens where part of their household food needs are grown—this information is not recorded by the Agriculture Department. The reasons for food production are varied, depending on the socio-economic status of the producers, and include: tradition, economic necessity, profit, and leisure.

The kinds of food grown by food producers depends to some extent on their ethnicity. Many subsistence producers (growing enough food to make a self-sufficient household) are Sundanese (the local ethnic group), whose diets contain similar basic features across class and income level. The regular Sundanese fare, which consists of rice, fresh or cooked vegetables, fried or salted fish, red meat on special occasions, and chicken once a week, is reflected in the types of food grown. The demand for foodstuffs is also influenced by

migrants from other areas of Indonesia who bring their cuisine with them, as well as by a sizable Chinese population.

The number of Bandung residents officially recorded as working in agriculture as a primary occupation is 6,948 (interview, Municipal Department of Agriculture). The range of income for those whom food production was the main source of income, among the people interviewed, was Rp. 100,000 to Rp. 200,000 per month (US\$ 50 - US\$ 100). This gives an average of Rp. 1,800,000 (US\$ 900) per year (if food production brings in a constant income per month).

4.5 Location of food production areas

The topography of Bandung divides the food growing areas into two main sections. The southern area of the city, which lies on a flat plain, is suited for rice production, while the northern area, which is at a higher elevation, has more hills, and being somewhat cooler, is more suited for vegetable production. Rice is grown in the northern areas as well, on terraced slopes, and vegetables suited to the terrain are grown in the southern area. Garden and animal production occur throughout the city, while occurrences of market and subsistence production increase with the distance from the city centre. Market and subsistence production can be found throughout the city, often adjacent to densely populated areas, preserved while urban development leapfrogs over them. Very little land within the city is left unattended; food (plants and animals) is grown wherever possible—in fields, in river valleys, backyards, rivers, vacant lots, and on rooftops.

Gardens in backyards, fruit trees along streets, and planted areas along river banks can be found close to the city centre. Larger food production areas start at about 3 kilometres from the city centre. Neighbourhoods in this intermediate area, between the city centre and the

periphery, depending on the occupation of the residents, often have some significant space allotted to food production. Behind or within an enclave of houses lie communal or individual pieces of land planted as a vegetable garden, or as a multi-storey home garden which makes efficient use of space (see Stoller 1978; Christanty 1985; Anderson 1986). Plants found in these gardens include: green onions, garlic, bitter gourd, peanuts, lemon squash, chili peppers, sweet potato, cassava, tomato, egg plant, different leafy greens, celery, taro, sugar cane, and various fruit trees. Goats are kept in cages, or on small enclosed areas near houses. Market gardening occurs both within and at the periphery of the city, as well as along transportation routes. Market crops include leafy greens, onions, garlic, peanuts, tomato, egg plant, potato, and various fruits. Intercropping (planting several different crops together, such as onions and greens among banana trees) is common. Cattle graze in small fields in less densely built areas. Both within and on the periphery of the city, fish are grown in unused rice fields or ponds; fish and crab are grown in cages kept in the rivers.

4.6 Food distribution system

Many of the fresh vegetables that come to market are grown locally, within the city, or in surrounding towns and villages. For example, Lembang, to the north, having a cooler climate due to a higher elevation, is especially suited to vegetable production. Fruits may be grown locally, but may also come from as far away as Kalimantan; many fruits eaten in West Java come from Malang, in East Java. Trucks drive night and day all over Java to distribute produce such as fruit and fish while it is still fresh.

Bandung has been assigned a "dry dock" function, in order to serve as a major distribution point for the province of West Java. The development of several large regional markets has been initiated and supported by government. The regional markets begin a hierarchy of

markets for the city and its region, until food reaches every neighbourhood. Traditional markets can be found throughout the city, supplied by both local and other sources.

4.7 Scale of food production

The amount of land currently classified as "agricultural" (1993) within the municipality of Bandung is 6,061 ha, or 36% of the total (16,606 ha). This includes production from rice fields (wet), dry fields, and yards in the municipality of Bandung. From 1992 - 93, there was a 3% decrease in total urban area used for agriculture, or a 7% decrease in total agricultural land (Table 1).

Table 1. Agricultural area in Bandung (1992, 1993)

Land Use	1992 (ha)	%Land Use of Agricultural Area	% Land Use of Municipal Area (16,606 ha)
1. Wet rice-field	3,489	53%	21%
2. Dry field	864	13%	5%
3. Yard	2,170	33%	13%
TOTAL	6,523		39%
	1993		
1. Wet rice-field	2,854	47%	17%
2. Dry field	651	11%	4%
3. Yard	2,556	42%	15%
TOTAL	6,061		36%

(Source: Bandung Municipal Department of Agriculture)

Profits from agricultural production within the city appear to be growing; profits increased from Rp. 4,366,330 (US\$ 2,183) in 1988, to Rp. 6,580,420 (US\$ 3,290) in 1989, reaching Rp. 9,562,940 (\$US 4,781) in 1990 (*Regional Domestic BRUTO Production 1990*, 148). Profits from agricultural production as a percentage of the municipality's total revenue were unavailable at this time. Table 2 indicates production rates and gross income from food

production in the municipality of Bandung for 1992. It should be noted that this data contradicts other information from the same source. For example, the same source later lists the amount of land under rice production as 3,489 ha (Table 1) for 1992 instead of 4,700 ha, and the total harvest area amounts to 5,690 ha instead of 6,523 ha (Table 1) for 1992. This information is to be taken as an indicator only, not as a definitive description of the state of affairs of the food sector in Bandung⁶.

Table 2. Food production and income in Bandung (1992)⁷

Commodity	Harvest Area (ha)	Production (ton)	Income / ha (Rupiah)
Wet-field rice	4,700	24,482	878,638
Corn	195	586	616,810
Cassava	104	1,040	n/a*
Sweet Potato	44	264	n/a
Groundnut	n/a	21	n/a
Vegetables	433 (total)	9,920	n/a
Green bean			2,184,375
Tomato			1,515,595
Leafy Greens			1,293,580
Chili			5,325,356
Fruits**	214	43,220*	n/a
TOTAL	5,690	79,533	

n/a = not available

**Fruits include: avocado, mango, lime, orange, durian, jambu, papaya, banana, pineapple, salak.

(Source: Bandung Municipal Department of Agriculture)

⁶The figures in these Tables are included simply to show what kind of information is available, and to give an indication of the food production activity in Bandung; they are not intended to be used for extrapolating about the future of food production, or about the rate of disappearance of food producing land. This data can only be considered in this limited way because: first, comparative information was not available, and second, the means to verify how these figures were achieved were not available. In addition, these figures should only be read as "official" figures, possibly not representing the whole range of food production activities in the city.

⁷ This information is for Bandung's new administrative area (as of 1989) of 16,606 ha.

City planners are predicting that agricultural activities within the city will continue to decrease; agricultural lands will decline from 36% to about 2% of the urban area over the next 15 years, while park space and open space (managed) will increase from 6% to 12% (interview, senior planning consultant). According to the municipality of Bandung's Agriculture Department, agriculture within the city boundaries is not valued primarily for the capacity of its production. Rather, it is seen as a limited means of decreasing the city's dependency on food supply from other areas, as well as adding to urban greening and urban aesthetic value. It is recognized that urban development, especially for housing, has caused the disappearance of open space and farm land (interview, Municipal Department of Agriculture).

Produce available in Bandung markets is grown in the surrounding region. Kabupaten Bandung supplies potatoes, fresh vegetables, and fruits; Kabupaten Majalengka supplies cabbage, onions, chilies, ginger; Kabupaten Cirebon supplies red chili, onions, rice; Kabupaten Cianjur supplies rice, fresh vegetables, fruit; other areas of West Java such as Kuningan, Subang, Sumedang, Ciamis, Purwakarta, and Garut also supply Bandung (Municipal Department of Agriculture, interview). Bandung's food supply is also supplemented by food from other areas of Java and other islands of Indonesia. However, in order for this food supply to be efficiently distributed, the supply line between the region and city needs better coordination by the department of agriculture at the provincial level (interview, senior planning consultant).

Table 3 presents the main agricultural production capacity for Bandung for one year (1992). This data, as with the information presented in Table 1 and 2, may contain inconsistencies. For example, Table 3 shows that the municipality produces 8% of its vegetable needs. However, the importance of leafy greens in the Sundanese diet, the need for quick transport to market to keep these greens fresh, and the visible amount of leafy greens grown

throughout the city on various sizes of land, make this figure seem low, implying that some food producing activities may not have been included in this count. Table 4 is included to give an indication of the amount of livestock kept in the municipality of Bandung.

Table 3. Food required for the municipality of Bandung (1992)

Commodity (Tons)	Produced in Bandung	Required by Bandung	Produced elsewhere	% Own Produced
1. Rice	16,684	218,928	202,280	7%
2. Roots	1,304	34,400	33,096	4%
3. Beans	21	10,887	10,866	.2%
4. Vegetables	9,920	119,063	109,143	8%
5. Fruits	43,220	59,457	16,237	73%

(Source: Bandung Municipal Department of Agriculture)

Table 4. Animal production in Bandung (1989)

Large Animals	Male	Female	TOTAL
Cow, milk	67	365	432
Cow, meat	87	109	196
Water buffalo	186	232	418
Sheep	5,753	5,749	11,502
Goat	297	345	642
Horse	105	111	216
TOTAL	6,495	6,911	13,406
Small Animals			
Chicken, free range	100,722	62,161	162,883
Chicken, laying	9,156	97,644	106,800
Chicken, broiler	57,523	36,574	94,097
Duck	2,217	2,001	4,218
TOTAL	169,618	198,380	367,998

(Source: Statistik Kotamadya Daerah Tk. II Bandung 1989, 61)

4.8 Introduction to interviews and observations

In this section, the results of interviews with food producers in Bandung are presented. See Figure 5 for map indicating location of study areas. The various kinds of food production enterprises are described, with examples to illustrate each of them. The food producer's estimated value of the food produced is included in these examples; however, no conclusions have been drawn here regarding this data, due to the limited sample size, and to the lack of comparative data. This section is introduced by a description of the three areas of Bandung in which most of the interviews were conducted: *Lingukanan* (neighbourhood) Neglasari, in Kelurahan Isola ("Negla") in the northwest, Kelurahan Palasari ("Palasari") in the east, and Kelurahan Dago ("Dago") in the north of the city. These areas represent different physical areas of the city (west, north and east) with varying topographical features, and offer examples of the variety of urban food production to be found within the city. Informal interviews with other food producers, as they were encountered by the interviewer, were carried out in various areas of the city.

The descriptions of food production in the study areas fall within the parameters of the definition of urban food production generated in Chapter 1. Thus, whatever the size of production, all of these enterprises have in common these factors: they are conducted by urban dwellers who produce food, within or on the periphery of the urban area, for distribution to, and consumption by, other (local) urban dwellers, or themselves.

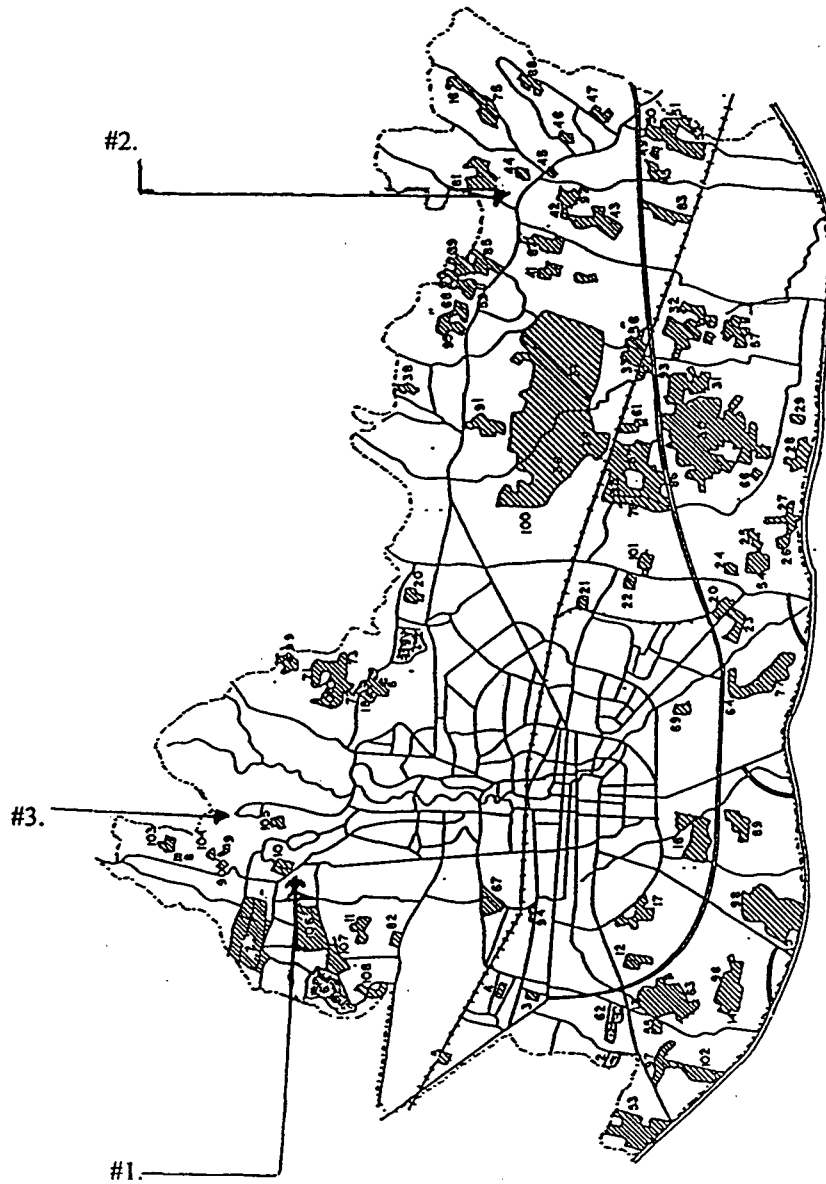
Figure 5. Map of Bandung showing study areas

(Source: Akbar and Kombaitan 1993)

#1. Lingukanan Neglasari,
of Kelurahan Isola

#2. Kelurahan Palasari

#3. Kelurahan Dago



4.9 Description of study areas

1. Lingukanan Negla, Kelurahan Isola

Just a five minute walk off the busy street of Setiabudi (which provides the northern entry and access to Bandung) is the quiet neighbourhood of "Negla", in Kelurahan Isola, which is part of Kecamatan Sukasari. Negla is situated in the northwest area of the city, about eight kilometres from the city centre. Since Negla lies above 700 m, it is part of the designated conservation (water catchment) area. The total area of the kelurahan is 179 ha; 130 ha (73%) is used for housing and yards; 38 ha (21%) for dryland gardening; 2 ha for fishponds or water reservoirs; 2 ha for cemetery plots; 7 ha for roads; the rice growing area is not listed, but this is also a land use in the kelurahan (*Potensi Desa* 1992-93).

The kelurahan borders a large institution (a university), where many of the inhabitants of this area work as teachers or in administration. These people tend to live in the larger, newer houses which are closer to the street. Others work as civil servants, builders, traders. The individuals whose main occupation is designated as "farmer" number 2.9% of the workforce (*Potensi Desa*, 1992-93). Many who do some form of food production don't depend on it as a main source of income and have other jobs to support their families.

The interviews were done in a settlement of houses lying about 15 metres below the main street. Below the houses are rice fields irrigated by a river; rice terraces and vegetable patches lie on the facing hill (south slope). Some of the houses have been renovated, while other are under repair. New houses are being added to the area, where the walkways are already so narrow that they require walking almost sideways to get through. A cement washing area is stationed near the entrance of the settlement. Within the group of houses is a courtyard area, where there are goats in cages, chickens running around, and children playing on the porches.

Farmers grow rice, red chili, onion, tomato, cauliflower, greens, banana, cassava, and flowers. About 60% of the houses' yards are used for flowers and fruit trees, valued for their beauty, shelter and fruit. Farmers who grow rice usually do not sell it because the land they are working on is so small that it produces enough only for their own consumption. The people also have small ponds for fish, and keep goats, ducks and chickens.

The path through the neighbourhood leads straight through it to the second washing place. There is a small stream beside the washing place, which serves to irrigate the lower fields. It appears to be quite normal to urinate and defecate in the stream; it's "what the stream is for". Further upstream there is an area full of vegetables which rises 100 metres above the rice fields. This is a green, quiet, protected area, almost walled in by surrounding cliffs. Hydro lines cross this area, but underneath them lie jungle and farmland, which is full of birds—it is difficult to believe that this quiet haven exists just 15 minutes from one of the busiest roads and fastest developing areas of Bandung! There are numerous small banana trees whose leaves are harvested for commercial use (wrapping food sold at the market or food stalls). Other larger trees provide bananas for eating and for selling at the market. There are signs on the steep sections that people are practicing anti-erosion methods by planting trees which hold soil and water with their roots.

2. Kelurahan Palasari

Kelurahan Palasari, part of Kecamatan Cibiru, borders the main road going east out of the city; it is about twelve kilometres from city centre. This "village," as the administrator calls it, was established a long time ago, as a part of Kabupaten Bandung. People came here from outside Bandung in the 1950s, as refugees during the Independence War. More migrants came in the early 1970s, when the industries began to establish in the district. Kelurahan Palasari became a part of the municipality of Bandung in 1987.

Palasari's combination of spatial development and topographical features make the ascent into the kelurahan fascinating. Factories and small stores occupy the land bordering the road. Motorcycles hover at the intersection, waiting to transport people up the hill into the kelurahan. The factories are succeeded by some older housing of long term residents, as well as newer buildings housing factory workers. A middle class section with a new housing development follows. After this section the houses begin to thin out, and the fields start, leading up to the steeper hillsides, where a more traditional way of life can still be found. About 30% of the total 217 ha appears to be built-up area. Those who are "farmers" number 10% of the total kelurahan workforce (*Potensi Desa* 1992-3).

At first glance the kelurahan looks well organized and prosperous. The houses in general are in good condition, since the people now (with the influx of factories, renters, middle class) have more money to repair houses. There is also credit available from the KUD (local cooperative unit) to build and repair houses. However, with a closer look, some of the problems become apparent: inadequate drainage, especially in the lower part; children playing in garbage heaps by the side of the road; and poor water supply.

There is a mix of educated and uneducated, long-time and migrant, rich and poor, people in this kelurahan. There are many people who are recent migrants, who came to this kelurahan from other areas of Bandung as well as from all over Java in order to work in the factories here. Many of the long-time inhabitants with a low level of education do not use *Bahasa Indonesia*. They learn it in school, if they go, until grade 6, but do not use it in everyday speech because there are lots of communication sources in the local ethnic language—Sundanese. People can do all their trading in this language, and receive news from the local Sundanese radio.

3. Kelurahan Dago

Kelurahan Dago, in Kecamatan Coblong, lies at the "end of the road" of one of the main streets of Bandung about six kilometres from the city centre, in the north end of town, also in the conservation area. It is hilly throughout, borders a national park, and is crossed by one of the major streams running through Bandung. The total area of the kelurahan is 258 ha, with land uses as follows: housing and yards, 234 ha (90%); rice fields, 19 ha (7%); fishponds or water reservoir, 2%; other 3% (*Potensi Desa* 1992-93). The *lurah* (head of kelurahan) estimates that 25% of the land in the kelurahan is food production area. Although this kelurahan lies on the periphery of the city, its increasing density shows the process of urbanization. Other marks of development include tourist facilities, such as hotels and restaurants, which are slowly creeping up the hillsides. These developments lead to congestion on the few, narrow roads to the area. Many teachers and administrators at the Bandung Institute of Technology have housing here.

Most people in this area are working in trading (informal), farming, and as government employees. As with Negla and Palasari, agriculture is not necessarily the primary source of income for those who grow food. In some parts of the kelurahan, living arrangements have not changed since the 1950s and 1960s, when there was an influx of people to this area (during and after the Independence war). Thus, some people here are still living very rural lifestyles, while others are very urban. About 2% of the total workforce in Dago are listed as "farmers" (*Potensi Desa* 1992-93).

The local administrator predicts that in five years all land in this area will be developed for housing. More than half of the remaining open land has already been sold for development. There is pressure on the remaining food producers here to sell their land to hotels; however, there are some farmers who are holding out against development, not willing to sell for any price. Most of the land under agricultural use is in rice production; some vegetables are

grown. People also have fish (there is a lot of water available), as well as some goats and chickens. Most of the food produced is for own-consumption; if any is left after harvesting, people take it to the market to sell.

4.10 Typology of urban food production

This typology of urban food production is built upon observations of food production within the city of Bandung; additional types of urban food production may exist. Key factors in the typology are: cultivated area size, land tenure, quality of land (marginal or prime), household income structure, type of food production, infrastructure available. These factors provide the basis for a grid, included in the following section, which can be used in identifying policies and strategies for food production.

Type A Subsistence production

In subsistence food production, people are producing food as a main source of household food; some of the food may be sold if there is excess, in order to provide a bit of cash to buy other goods; this activity is also the main activity (occupation) of the household.

Type B Market production

There are a variety of circumstances under which people produce food for sale.

1. Business market production

Food is grown in order to sell it at the market; profitable crops only are planted; food production is the main source of cash income.

2. Supplementary income production

Food is grown mainly for cash, though not on as large a scale as market gardening; there is a cash income from other sources.

3. Market / subsistence production

Food is grown as a main source of income; the growers depend on their own produce for their food needs.

4. Market food production on marginal land

Food growers who wish to make money by selling food at the market, but who have no access to land, put their crops into untended, marginal land (market gardening beside irrigated areas of railway tracks).

5. Production on hobby farms

Wealthier people owning a sizable amount of land turn part of it into production for the purpose of sale. Labourers are hired to work the land.

Type C Household production

Households combine own-food production with purchased food in a variety of ways, but on a smaller scale than for subsistence production.

1. Substitution food production

The food is grown for self-consumption; there is a cash income for other needs from other sources.

2. Supplementary food production

Food growers use a small plot of land near the house in order to produce some food (cassava plot or fish pond); animals (chickens, ducks, goats, rabbits) occupy a common space; food production is not the sole source of food; food growing is not an occupation or source of income.

3. Supplementary or subsistence food production on marginal land

Food growers occupy marginal or abandoned land and practice land reclamation in order to produce food (on unirrigated land beside railway tracks, near dumps, by roadsides); income may or may not be available from other sources.

4.11 Summary of interviews illustrating typology⁸

Type A Subsistence production

Example 1

This subsistence farmer (Dago, Interview #1) grows vegetables, rice, cabbage, chicken eggs, chicken, and goats. He had been working for a company, but was let go, and is now farming full time with his wife, and has a family of two small children. He recycles wood found on the land for charcoal. He has been on this land for 15 years, and sold it 10 years ago, but feels that it doesn't matter whether or not he owns the land, as long as he can work it. He uses pesticides and fertilizers on his land, rents water buffalo once in a while to plough the land (Rp. 10,000/day). The whole family helps with the cultivating and planting, while neighbours also help with the harvesting. 20% of the vegetables and 20% of the rice are sold at the market, while the family keeps 80% of the vegetables, rice, and all of the meat (chicken, goat, fish). The farmer stated the family income as about Rp. 130,000 per month (US\$65); half of this comes from the *warung* (small store) that his wife runs. He estimated that 20% of his income is spent on food, 10% to housing, 10% on clothing, and 60% on non-consumption goods. The food that the family does not produce itself is bought at the market (3 times per week), or daily at the *warung*.

⁸Illustrations for the different types of food production are identified according to area and interview number.

Example 2

Another farmer and his wife (Dago, Interview #4), with no other reported source of income, support their family of three children with the food grown on a small piece of land (175m²). They have rice, goats, and fish. Charcoal is made with wood from around the house. Family and friends help to prepare and plant the land. The farmer has learned some modern techniques about pesticide use from watching a TV at the *lurah's* office. He rents a water buffalo to prepare the land, and uses chemical fertilizers. He keeps 20% of the rice for himself, and 50% of the animals, and sells the rest. They buy other meat, fish, and vegetables at the market, and smaller items, such as spices and snack foods, at the *warung*. This farmer estimates that his income is Rp. 200,000 (\$US 100) per month, all from food production, and that eating costs take 30% of his income.

Type B *Market Production*

1. Business market production

Many of these establishments exist on the periphery of the city, where there are still large enough areas of land to enable large scale food production. A number of food producers interviewed mentioned that they did not own the land they were farming. They had either sold it in the past and were resident on the land until the owner decided to develop, or were renting it from the landowner. There are some medium sized areas within the city which are also dedicated to market production. Intensive crop production methods are used in order to make the most of the limited space available.

For some food growers, market prices determine at least a part of the crop they grow. For instance, if pepper prices are high, they will plant pepper. If, however, the prices are lower the next season, another crop will be planted (observation from Palasari). Another food grower has a different perspective; he never plants according to the market, since his

experience is that, by the time they harvest, the price has gone down again (observation from Negla).

Included in this group are those who produce specialty crops such as bonsai, nursery plants, hobby fish. These tend to be grown as a sideline, developed through local agricultural assistance and development programs. The goal is to diversify agricultural outputs by developing specialty crops directed specifically toward the urban market. In Palasari, for instance, a group of younger farmers are experimenting successfully with hobby fish and bonsai, as well as orchids and exotic bamboo. Other specialty crops are more traditional in nature, such as bamboo, which is sold for making products such as *anklung* (Sundanese musical instrument).

2. Supplementary income production

A retired couple (Palasari, Interview #1) owns two small pieces of land (total 500m²), on which they, and some of their nine children, plant food, mainly in order to sell at the market. They grow leafy greens, cabbage, bamboo, beans, and bananas. They use some natural fertilizers, such as compost. The vegetables are sold—50% to people from the neighbourhood who come to the house to buy, and 50% to the market. A collector will pick up some of the vegetables to bring to the market, except for the tomatoes, which the collector finds too risky to sell since they can't be kept fresh. The family will take this kind of produce to the market themselves, which, at about 4 kilometres away, is quite a distance to travel. They grow a bit of rice, which they keep for themselves, and they also keep their goats, chickens, and rabbits. Vegetables and spices are bought from the local *warung* once a day. A trip to the local market is made about twice a month. The family receives an estimated Rp. 300,000 (\$US 150) from food production per year, and the father receives Rp. 300,000 (\$US 150) per month in retirement money. There are twelve people in the house right now (including some grandchildren); an estimated Rp. 200,000 (\$US 100) per month is spent to feed this family.

However, they do not spend much money elsewhere—money does not go toward education, clothes, expensive food such as meat, or house repair.

3. Market / subsistence production

Example 1

An older couple (Negla, Interview #3), still fairly active, have an enterprise, with the husband's brother, on a large piece of land (1400m²) where they grow chili, banana, cassava, cauliflower; they also raise chickens and ducks. Two of the four children are independent; two are still studying. The couple sold the land in 1983; they will continue to farm until the owner develops the land. They also have land in a village near Bandung. However, the soil there is not very productive, so they let people rent that land. Both husband and wife spend a good part of their day in the fields; children and relatives help in the busy seasons. Pesticides, fertilizer, and labour cost about 25% of the harvest. This farmer uses inputs selectively. For instance, manure is applied for the base fertilizer, especially for vegetables. Chemical fertilizers are applied for certain purposes (such as fruit or flowers). This farmer always wears a mask when he applies pesticides. He also eats certain foods (such as eggs) before he applies the pesticide in order to anticipate the negative effects of the chemical material on his body. A collector takes the crops to the market. In this family, all the food is prepared at home; they do not depend on the *warung* or market. This farmer is a retired civil servant, and receives a pension of Rp. 130,000 (\$US 65) per year. Food production income brings in Rp. 175,000 (\$US88) per month. When they do not make money from selling vegetables, they take money from their savings.

Example 2

A middle-aged couple with two young children (Dago, Interview #3) has a large piece of land (about 4000m²), where they grow cabbage and cassava, as well as rice. The wife is a trader; she runs a stall in the market, where she sells their produce, as well as other goods. Food

production and selling is full time work for them, although the husband would like to sell the land in the next 5 - 10 years, and take up another occupation, such as bus driver, or full time trader. This farmer uses some natural fertilizer, such as the manure from his animals (goat, water buffalo, chicken, goose), and recognizes some of the dangers of chemical inputs. They sell 90% of the vegetables at the market, and keep all of the rice and cassava for themselves. Food production brings in about Rp. 100,000 (\$US 50) per month, and the trading stall at the market, another Rp. 100,000 per month. The total income is Rp. 200,000 (\$US 100) per month; 30% of this is spent on food purchases.

Example 3

A farmer growing food mostly for sale at the market (Dago, Interview #2) was interviewed at a field hut situated on a small corner of land, where he spends his days watching the crop. He and his wife have a sharecropping arrangement with the owner of the land. In exchange for taking care of the rice growing, and watching the fields, they get part of the harvest. They are older, so they don't have their children to support anymore; in fact, this farmer did own land before, but sold it in order to have money to provide for the children. With their share of the harvest, they take 75% to the market, and keep 25% for themselves. Food production provides 30 % of their stated income of Rp. 250,000 (US\$125) per, and 70% comes from his government employment pension. Food purchases take 50% of the total income.

4. Market food production on marginal land

Market gardening has been established on reclaimed land in areas of Bandung. Where there is access to resources such as water and nutrients, profitable crops can be grown. Examples of irrigated market gardens are found along the railway tracks. In another example, food is being produced on degraded land occupied by scavengers of Bandung, who, through a project with the Environmental Studies department at ITB, have organized to meet their own settlement and economic needs (Poerbo 1991).

5. Production on hobby farms

In the previous categories, the food growers are all in need of the food they grow in order to survive, or for their occupation (farmers, market gardeners). People who grow food who are from higher income brackets have varying reasons for doing so. There is a current trend for wealthier people, who own land on the periphery of the city, to start developing agriculture and orchards on their property. Labourers take care of the planting and harvesting, and a collector takes this produce to the market. They are also growing specialty crops, such as lettuce for restaurants, and flowers for the market. This trend is especially prevalent in the conservation area in the north of Bandung.

In another popular trend, wealthier people are acquiring working farms outside of the city as weekend retreats. Labourers, or the former owners, live on the property full time, taking care of it and working the land. In other cases, developers are acquiring tracts of land in areas which are traditionally dedicated to subsistence farming. This is occurring in the upland areas north of Bandung, where what is often critical land is being developed for estate housing. The land within the estate may continue to be farmed by the previous land users, who are generally poor, and who held the land in a traditional (*adat*) though not legal (according to the modern definition) way.

Type C *Household production*

1. Substitution food production

Example 1

A young family that depends on a mixed income was interviewed (Negla, Interview #1); the husband's occupation is a builder, but he works on his parents' land, with his wife, in between jobs. The farmer plants rice, beans, and cauliflower on a sizable piece of land; the rice is used for self-consumption, and as payment to relatives and friends who help with the

harvesting. The vegetables are sold to a collector who picks up them up once they have been harvested to take them to market. This was one of the few farmers interviewed who actually used organic fertilizer (from human waste). This farmer could not give the details of expenditures for food production, probably because it is not his main occupation; as well, he still depends on his parents as an economic resource.

Example 2

An older couple grows rice on a small piece of land not far from their home (Negla, Interview #2). Their children are all employees in the formal sector. They live close to their parents and support them financially. The couple work the land, which belongs to a relative, intermittently. They have a few goats which are sold at the market. Relatives help with the planting and harvesting of the rice, which is used for self-consumption. Other food, such as vegetables, soya bean cake, tofu, is bought daily from a local *warung*. The children are also trying to grow flowers to sell at the market, but so far this is only a small enterprise.

2. Supplementary food production

Vacant land throughout the city, and land adjacent to housing and other buildings, is used for growing fruit trees and vegetables. The plants consist of several layers, from trees to root crops. These multi-storey gardens seem to be a version of the "household" garden described by Stoller (1978).

3. Supplementary or subsistence food production on marginal land

An informal interview gives insight into the background of a food producer who has established a garden on land beside the train tracks. This man is a *becak* (pedi-cab) driver; he grows a garden along the railway, which is the closest open space near his house, in order to supplement his income and support his family. The railway company allows people who want to use the land along the tracks in exchange for keeping the area clean. The *becak*

driver has learned how to grow the different vegetables on his own; he does not have a rural background. He has also planted shrubs along the railway tracks, because he enjoys working with plants. This urban gardener is knowledgeable about numerous medicinal uses of the garden's plants.

4.12 An assessment grid for developing policy

The typology developed through the research suggests a tool that can be used for assessing types of policies and strategies for the support of urban agriculture. This model (Figure 6) includes considerations of the following features: 1) type of food produced (vegetables or staples [rice, cassava] or both; 2) income sources (many households have a variety of income sources); 3) distance from centre of city (and from smaller business centres); 4) access to, and type of, transportation (determining whether the producer can get products to market on time, as well as ease of obtaining inputs); 5) topography (hilly or flat); 6) water supply (whether there is irrigation where needed, or sufficient well water; drainage capability); 7) soil type (from nutrient-rich to medium to degraded); 8) size of area under production (ranging from backyard gardens to several hectares used for market gardening); 9) type of tenure (from squatter status to temporary contracts to ownership, including length of time in the area); 10) other factors, such as degree of pollutants in the area; existing support systems for agricultural activities.

Figure 6. An assessment grid for developing policy

Primary Purpose of Production	Subsistence Production	Market Production	Household Production
Production Parameters	<i>eg. A, Example 1</i>	<i>eg. B2</i>	<i>eg. C3</i>
1. Type of food produced	<i>-mixed vegetables, rice; bananas; chickens; goats</i>	<i>-mixed vegetables, rice; chicken;, rabbits; goats</i>	<i>mixed vegetables</i>
2. Income sources	<i>-food production -warung</i>	<i>-food production -retirement pension</i>	<i>-becak business</i>
3. Distance from city centre (and distance from local centre)	<i>-6 kilometres (1 kilometre)</i>	<i>-12 kilometres (4 kilometres)</i>	<i>-2 kilometres (.5 kilometre)</i>
4. Transportation	<i>-walking, bus</i>	<i>-3 kilometres from major road -walking, motorcycle, bus</i>	<i>-close to road -walking, becak, bus</i>
5. Topography	<i>-quite hilly</i>	<i>-sloped land (terraces necessary)</i>	<i>-flat to slightly sloping (in railway bed)</i>
6. Water Supply	<i>-deep well; no irrigation system</i>	<i>-deep well; no irrigation system</i>	<i>-depends on rainfall; good drainage</i>
7. Soil type	<i>-nutrient-rich</i>	<i>-medium</i>	<i>-degraded</i>
8. Size of area under production	<i>-not stated; approx. 750 m²</i>	<i>-500m²</i>	<i>-50m²</i>
9. Type of tenure	<i>-renting; sold this land 10 years ago</i>	<i>-own land; many years in the area</i>	<i>-agreement with railway company</i>
10. Other factors	<i>-other wage- earning skills present; not used currently</i>	<i>-keep own animals for food; large household (12)</i>	<i>-air and soil pollution due to proximity to railway tracks</i>

This grid can help to assess the quality, adaptability, and sustainability of food production in different areas of the city. For example, a review of the factors affecting the subsistence food producer using land adjacent to the railway track shows that soil quality and air pollution are areas of concern. Ways of improving soil quality might be introduced. Although it is difficult to mitigate the impact of air pollution, this garden plot provides an ideal site for a study on effects pollution on plants, an area in which more research is needed. (Other examples from the research have been used to illustrate the remaining categories.)

4.13 Conclusion

Almost every piece of available land in the city is used for some kind of food production, whether or not the producers are the owners of the land. The Agriculture Department is responsible for the areas officially under food production; however, much of the food production in the urban area is not adequately accounted for or supported. The rapid development of the urban area places additional stresses on food production activity. The impact of these urban factors are examined in the following chapter.

CHAPTER 5

Analysis of Food Production Opportunities in Bandung

5.0 Introduction

There are elements of the city's activity and management that inevitably affect food production activities. The first part of this chapter discusses the factors which affect food production in the city, such as diversification of the functions of Bandung, the increase in population, and the rapid rate of urbanization over the last 30 years. The second part classifies the specific opportunities and constraints for urban food production in Bandung which have been identified through interviews with city officials, food producers, and the following review of the city's development.

5.1 Urban growth rate

Bandung's population has grown from 2,000 in the early part of the nineteenth century, to about 2.6 million today. It is currently the third largest and one of the fastest growing cities in Indonesia (Akbar and Pribadi 1992, 126, 129). One municipal planner predicted that in 10 years, Bandung municipality's population will increase from the present 2.6 million to about 3.5 million people (interview, BAPPEDA director). Bandung's urban growth rate for 1980 - 1990 was 7.3% (*Penduduk Menurut Jenis Kelamin & Wilayah* 1990, 8). These growth figures only represent development inside the administrative boundary; in reality, many people who are active in Bandung actually live outside the administrative boundary (Akbar 1991, 63).

Migration to areas lying adjacent to the city has occurred over the last decade due to the development of housing and industries on the urban fringe. It is predicted that other factors,

such as crowding and severe congestion in the inner city, will encourage the continuation of this trend (Akbar and Pribadi 1992, 126). At the same time, most of the rural districts in the Bandung metropolitan area (as of 1986) will face a net out-migration towards the urbanized areas both within the regency and the municipality of Bandung (UDS 1990, 1.2). The urban growth rate of the Bandung Metropolitan Area is expected to be 1.8%, the whole of the Bandung regency and municipality together, 2.5%, and the Botabek area, 4.1%, per year over the period 1985 - 2000 (ibid., 1.2).

To put Bandung's size and growth in a larger context, the urban population of West Java was about 5.7 million in 1980. Given the estimated average growth rate of 3.1% per annum, the urban population is projected nearly to double by the year 2000 (UDS 1990, 1.2). The projected urbanization rate (the part of the population to be classified as urban as a percentage of the total population) for West Java shows an increase from 32.3% in 1986 to 43.4% in 2000 (ibid., 1.7). These trends of urbanization show the inexorable rate of growth, and are reflected in changes in economy, land use, and infrastructure.

5.2 Shift in economy

The regional economy of the Bandung Metropolitan Area (which includes both the municipality and regency) is growing rapidly in industry and manufacturing, providing textile, garment, metal, chemical, and paper industries for domestic markets. The garment and the large-scale aircraft industries are beginning to find niches on the international market. Of the large-scale industries, textiles and garments comprise 70% and food processing 60% of the total manufacturing activity in Bandung (Akbar and Pribadi 1992, 131). Bandung also has many public sector jobs (30% in 1986), since it is the capital of the province of West Java (ibid., 131). Advantages from such a large public sector include more jobs in the service sector and increased financial activity. For example, more new banks are being built both in the central and surrounding area.

In contrast, the role of agricultural activities in the Bandung area has been decreasing in the past few years (Akbar and Pribadi 1992, 126). Employment growth in the agricultural sector of the Bandung Metropolitan Area has slowed from 1.4% to 0.8 % annually over the past few years ending the 1980s (ibid., 128). At the same time, employment in the manufacturing sector is rising at a rate of 2.5 to 3.0% per year (ibid., 130). However, with a continued increase in population growth and a levelling of industrial growth, analysis predicts that unemployment will reach 18% by the year 2000 (Akbar and Pribadi 1992, 149).

These growth trends are likely to continue for Bandung, given the intensification of activity in the Jakarta-Bandung Mega Urban Region. The total GDRP in the Bandung Metropolitan Area (which includes both the Bandung municipality and the regency) is projected to increase at an annual rate of 4.2% in 1989-2006 (Akbar and Pribadi 1992, 126). The swift changes in economic structure from agriculture to trade, industry and services create a specific pattern of land use priorities: first trade and service business, then industry, then agriculture (Pribadi and Sofhani 1993, 39).

The municipal government encourages industrial development on several levels, from providing incentives for factories to operate, to supporting home industries (interview, BAPPEDA director). For example, certain areas have been designated as trade centres (Community Economic Centres), such as Cihampelas ("Jean Street"), and Cibadayut (the shoe area in the south of the city). In these areas, the individual producer can sell goods directly to retail outlets. A measure of deregulation and debureaucratization favours the shop owners so that they can build without a permit and according to their own style. These properties are not taxed and formal regulations are waived for these Special Retail Zones. At the same time, these Community Economic Centres serve a tourism purpose. For instance, the streets between the shoe centre in the south (which, at 1.5 kilometres long, with shops on

both sides of the street, provides a total of 3 kilometres of shoe shopping, and the largest "shoe shop" in the world) and the jean centre in the north are one-way, and form a loop from which it is easy to visit the local volcano and hot springs (Tangkuban Prah and Ciater), as well as to stop at discos and fast food outlets.

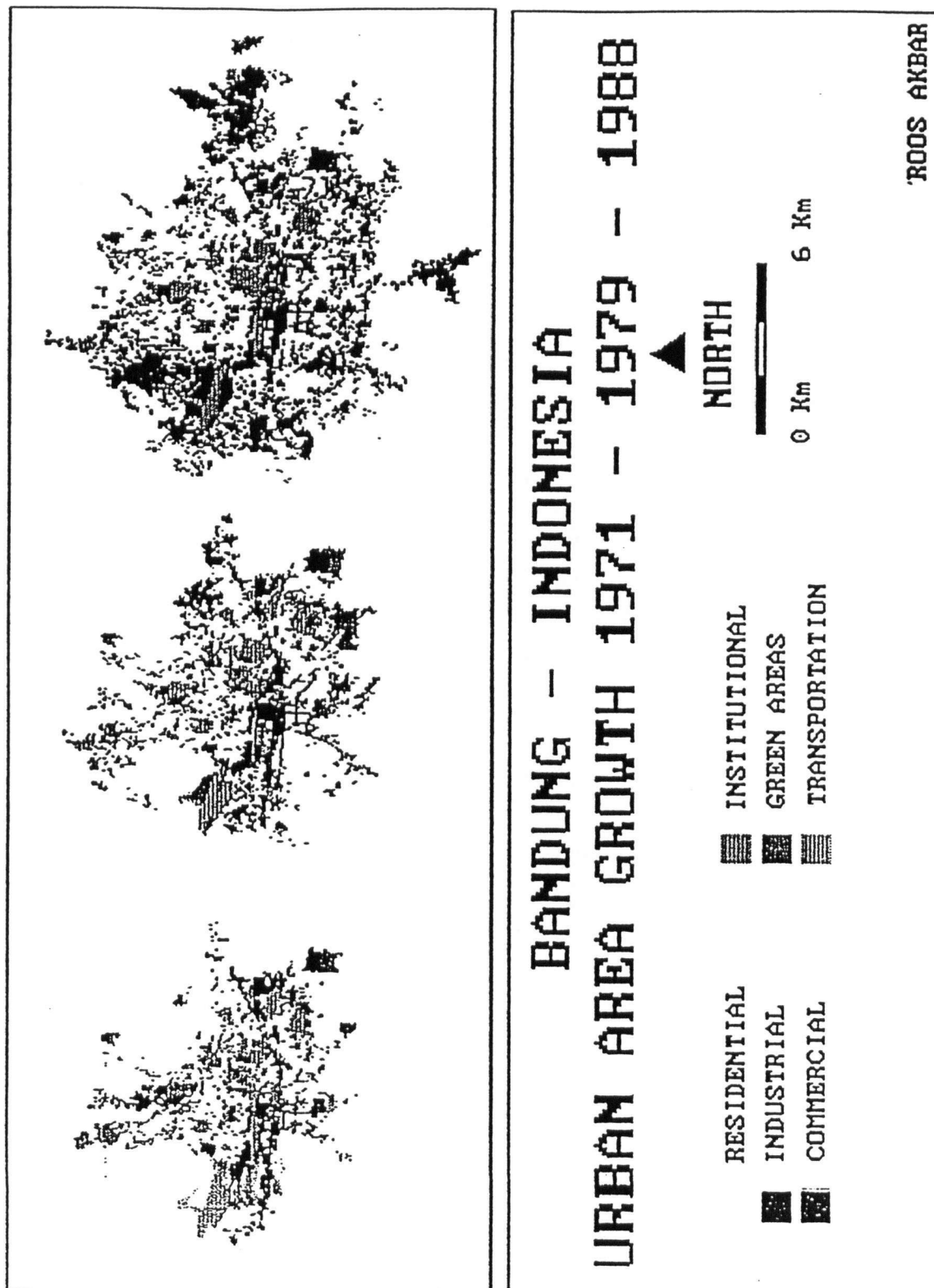
5.3 Developments in land use

Each main land use has grown relatively evenly over the past 20 years, with an average proportion of 71 : 10 : 8 : 11 for residential : industrial : commercial : institutional use in the Bandung urban area (pre-boundary change data) (Akbar 1992, 33) (see Figure 7).⁹ The amount of land currently classified as "agricultural" within the municipality of Bandung is 6,061 ha (Municipal Department of Agriculture 1993), or 36% of the total (16,606 ha) (post-boundary change data). The amount of land currently classified as "park land" is approximately 996 ha, or 6% of the total municipal area (interview, Parks Department). The pace of economic development in the urban area makes it difficult to reserve land for uses other than industry or residence. According to the prediction of one planner, agricultural land area in Bandung will decrease to about 2% coverage over the next 15 years, while park space and open space (managed) will increase to 12% (interview, senior planning consultant). Most new residential development is characterized by extension, which is the occupation of non-urban land.

⁹The term "urban area" is to be differentiated from "administrative area". The urban area is the built up area of the city, including the "islands" of non-built-up area for non-urban purposes (agriculture, water). The administrative area is the area delineated by the legal boundaries of the municipality (Akbar 1991, 33). This data regarding the distribution of land use over the last 20 years refers to 1989 sources, with the old boundary in effect.

Figure 7. Urban Spatial Growth Pattern

(Source: Akbar and Kombaitan 1993)



The average proportion of the three types of residential change for 1970-1990 was 74 : 16 : 10 for extension : densification : penetration (Akbar 1991, 76).¹⁰ Residential areas are increasingly being located in the restricted (conservation) areas (above 700 m), where there is a regulation stipulating a maximum of 40% coverage on any lot developed in this area, and unsuitable terrain (areas with more than 10% slope). Rice fields, easy to build on because they are flat, are also being taken over by residential development.

Reasons for the dominant settlement feature of extension include: the higher price of land in urban area, and decreasing amount of suitable area for residential development within the urban area and within the administrative boundary (*ibid.*, 61). Extension is also significant in the regency; in the period 1980-90, 71% of the land developed for housing was formerly wet rice fields (Pribadi and Sofhani 1993, 12). Meanwhile, the spatial distribution of industry—70% of all industrial jobs are located in the regency, and 50% of these jobs are located just outside the municipal boundaries (Akbar and Pribadi 1992, 131)—is causing development on agricultural land in the regency. From 1980 - 1990, 76% of the land developed for industrial purposes in the regency was converted from dryland agricultural area (Pribadi and Sofhani, 1993, 12).

The rate of growth of the urban area within the administrative boundary has been increasing quickly over the last 30 years. In 1971, the urban area covered only 50% of the administrative area; by 1979 the urban area covered 65% (rate of change from 1971: 1.9% per year); by 1988 the urban area covered 85% (rate of change from 1979: 2.2% per year) (Akbar 1991, 49). Conversion of green areas to residential area increased by 18 ha per year from 1971 - 1979, and by 44 ha per year from 1979 - 1988. For the same time periods,

¹⁰ Extension = changes from non-urban to urban or residential areas; densification = changes from green areas in urban area into built-up or residential areas; penetration (positive and negative) = all changes to and from residential areas (Akbar 1991, 57).

conversion of non-urban area to residential area increased from 87 ha per year to 198 ha per year. In total, the annual addition to residential areas comprised 105 ha during the years 1971 - 1979, and to 243 ha per year from 1979 - 1988 (ibid., 60). Due to lack of definition of "green space" (whether this includes agricultural land under use, or land held in speculation), as well as lack of data for the current rates of growth for the urban area, it is difficult to extrapolate from these figures, except that they show a steady, fast-paced rate of growth of the built-up urban area.

Residential areas are shifting with the growth of the city. Over the period 1971 - 1988, the residential area within 0 - 2 kilometres from the city centre decreased, and the residential area over 3 kilometres from the city centre increased. The 0 - 2 kilometre zone around the city centre is mostly commercial area. The largest residential area shifted from the 2 - 3 kilometre zone in 1971, to the 3 - 4 kilometre zone in 1979, to the 3 - 5 kilometre zone in 1988 (Akbar 1991, 43). According to 1988 data, all main land uses are tending to become located further away from the city centre, except for commercial and transportation, which are, at maximum, 7 kilometres away from the city centre (ibid., 49).

Land on the periphery of the growing city plays the role of a transitional area. The periphery is neither fully urban nor fully rural; it has a mixture of urban and rural land uses and building types as well as vacant land (Akbar 1991, 16). With lack of zoning, unclear ownership, and unclear jurisdiction, this land is open to absorption by urban uses.

These figures and trends reveal that the major land uses (other than agricultural or green space) are being located throughout the municipality; this progress is accompanied by the surrounding or invading of agricultural land. These trends can be expected to continue given the present rate of population and industrial growth, contributing to the disappearance of green space, including agricultural land, in the municipality. Indeed, these trends have led

one planner to conclude that "[without] any addition of green areas to the total urban area, Bandung will face an environmental problem" (Akbar 1991, 62). Another planner stated that Bandung will be more like Jakarta in the future since it is becoming increasingly urbanized and lacking green space, adding that, in effect, Bandung is already a part of Jakarta because of the growing density of settlement between Jakarta and Bandung (interview, senior planning consultant). The following analysis commenting on the area between Jakarta and Bandung ("Jabotabek" and "Jabopunjur"), also impacts Bandung. The implication of the current rates and patterns of urbanization is that "land use management within the region must be dramatically improved if the negative impacts of land use changes and conflicts are to be reduced to allow for an environmentally sustainable development process" (Douglass 1989, 213).

5.4 Spatial planning

Bandung's Master Plan, which was written in 1972, and periodically updated, contains a baseline of information about the city. However, it tends not to be followed because the area is growing so rapidly and because it does not include a comprehensive implementation strategy. With the number of people settling in the city increasing quickly (from 1.5 to 2.5 million in less than 20 years), there are many compromises made in settlement planning (interview, BAPPEDA director). The municipal government does not have the time or resources to monitor or sanction all the different activities in the city, such as housing for semi-permanent occupancy, housing developments without infrastructure, and the increase in industrial and commercial activities. After 1976, the city decided that it had to accept that there was a fast pace of growth, and that related activities would occur. The role of planners is to improve conditions within this rapid development where possible (interview, BUDP director).

A strategy of "partial" planning, or "planning by doing" has been adopted, where immediate needs (such as housing) are the first priority, and then, when there is time and money, other aspects of planning for the urban area can be dealt with (interview, BUDP director). This kind of planning is not unique to Bandung. Systematic planning is new in all cities in Indonesia. The actual planning strategy often consists of a site specific, problem oriented approach (interview, *ibid.*). Due to these adaptations of planning strategies to meet the reality of the situation, urban spatial planning falls under the jurisdiction of several municipal departments and corporations. Thus, for example, while the overall city planning in Bandung is carried out by the city planning department (*Tata Kota*), the Bandung Urban Development Program looks after the sewage system, and a water corporation (PDAM) runs the waterworks.

An example of problem oriented planning in Bandung is the response to the issue of rapid growth without adequate infrastructure. Before the 1970s, much of the existing infrastructure in Bandung was still from the Dutch period. With density increasing, the same water and sewerage pipes were being used by three times the number of people than for which they were originally built. In 1976, the local government, with the central government and the Public Works Department, created the Bandung Urban Development Sanitation Study, resulting in the Bandung Urban Development Program (BUDP) which works in conjunction with the Asian Development Bank. The rationale for focusing on sanitation was that it includes, by association, development of transportation routes and other infrastructure (interview, BUDP director).

In another example of "planning by doing", BUDP is carrying out projects to provide infrastructure for the large, densely populated areas in the centre of the city. BUDP is also involved in arranging the financing for this infrastructure, since, at this time, the city cannot depend on taxes from industry to support urban services. The economy is such that

enterprises will take all the capital they have in order to operate, whatever the regulations may be. Thus, BUDP has designed a payment system of cross-subsidies in order to pay for wastewater and waste disposal for some of the kampung improvement programs in the inner city areas (interview, BUDP director).

Land use planning issues in the regional context are increasing as Bandung's urban growth increases. For example, although planning between the Bandung municipality and regency is coordinated at the provincial level, there is no body coordinating planning between the two districts at the local level. Another problem arises in the growing urbanization of areas within the regency, including the area that is on the periphery of the urban, municipal area. The regency government does not have adequate staff or appropriate planning departments or authority to manage this kind of development (interview, BUDP director; Pribadi and Sofhani 1993, 42).

To begin to deal with some of the pressures of this growth and the lack of planning structure for a metropolitan region, a planning taskforce involving different departments has been established (interview, BUDP director). Planners, engineers, and the municipal government, are considering the growth in the municipality in the context of the regency, as well as neighbouring regions. Some of the issues that are to be considered by the intergovernmental taskforce in Bandung's functioning in the metropolitan area include solid waste management, sanitation, water supply and transportation. For example, Bandung has actually run out of room to dispose of its garbage within the city. As a result, Bandung has to coordinate its solid waste plan with the surrounding administrative areas. In another example, transportation needs to be improved in order to enhance the function of the city as the centre of the metropolitan area, so that it becomes more attractive and functional for the surrounding economic and industrial areas.

Identifying functions of the settlements within the metropolitan area surrounding Bandung is a result of attempting to coordinate planning for the metropolitan area. For instance, Lembang (to the north of Bandung) has been identified as a "vegetable growing city"; thus, no industry is to be developed here. Majalaya (to the south of Bandung) is to be the second area (after Bandung) developed for textiles. Banjaran has been identified as a city for middle income people. Half of it is in industrial use, half in residential use (interview, BUDP director).

5.5 Regulation for land use and building

There are a number of land use and building regulations in Bandung. For example, the water-catchment area in the northern part of Bandung has been designated as a "conservation" area. A stipulated land coverage (40% maximum built space) is intended to allow it to serve its function of water absorption and drainage. There are also wide zoning specifications, which include, for example, some zoning for industrial areas, in order to mitigate the impact of pollution. Floating zones (Akbar 1991, 33) are used in order to accommodate changes in land use as the economy changes (allowing, for example, the change from residential to commercial use within an area).

However, at present there is a lack of adherence to even these broadly based regulations, although building regulations for newly built housing are more closely followed. These stipulate an area of 30% open space in order to allow drainage, which is especially crucial for absorbing the monsoon rains (interview, Parks Department director). According to one planner, unless the population growth slows down, it will be difficult to introduce more effective land use regulations or more detailed plans for the development of industrial areas. Meanwhile, this aspect of spatial and environmental planning will continue to be sacrificed for settlement and employment purposes (interview, BUDP director).

5.6 Parks and other open space management

The municipal Parks Department maintains about 6% of the land of Bandung, which includes, in addition to official parks, the management of green space and plants at intersections, traffic islands, and medians, along streets, and in some cases, river banks (interview, Parks Department director). The Parks Department is responsible for approximately 400 locations, with a total staff of 200, and works together with the Agriculture and Cemetery Departments to maintain the green areas and plants. The Parks Department also runs nurseries for the city's greening program. Parks Department staff are involved in extension work, educating the public about such issues as the proper care of trees in parks (tree branches tend to get broken or used for fuel), and littering (ibid.).

The Parks Department coordinates with the city planning office (BAPPEDA) and the Environment Department for designing its yearly programs, and for the approval of its budget. For instance, it develops park space in conjunction with the city's Green Space Plan (*Rencana Ruang Terbuka Hijau Kota* 1989). This plan contains designs based on figures such as the optimal amount of green space and trees needed to provide the adequate oxygen and recreation areas for Bandung's citizens (ibid., III.16-17), and describes methods to implement these conditions.

The Parks Department, through its jurisdiction for plants and open space, deals with some environmental issues. For instance, it must consider the impact of city design on the greening program. The narrowness of the streets in Bandung means that the greening program on these streets has only a limited impact; there is not enough room for trees to grow. Pollution from traffic becomes a concern when streetside trees die and flowers do not bloom. The Parks Department is aware of the issues of urban heating; however, given its current jurisdiction and the rate of Bandung's development, it cannot effectively deal with

this problem, except to encourage the maintaining of open space, and the planting of trees and other vegetation around buildings (interview, Parks Department director).

5.7 Environmental management

The Environment Department at city hall has the function of data collection and monitoring certain resources such as air and water. It has little regulatory power, although it advises those who do, such as the Mayor and the city planning office. Some environmental management is carried out as a function of building and land-use regulations. However, these regulations are not always enforced. Lack of enforcement also limits the effectiveness of the designation of growth areas for different densities in order to protect environmentally critical areas (UDS 1990, 5.q). The difficulty in obtaining current information about the condition of the land, due to lack of controls for development and the lack of registration or clear title for many areas, makes urban resource management difficult (Akbar 1991, 30, 33).

Other activities, such as cutting of forests (for buildings, fuel or farmland) in the highlands to the north of Bandung, are also impacting the urban area. With no forest, the rainwater, instead of being absorbed by the soil and tree roots to soak down into the water table or flowing through the rivers at a moderate rate, rushes down to flood the lower plains on which the southern half of Bandung lies. It has been noted that the average flow of water from the rivers through Bandung has been dropping from 800 litres per day, to 500 litres per day, probably due to the rapid initial run-off (interview, BUDP director). At the same time, according to a number of people, the climate in Bandung has become drier and hotter, creating an even greater demand for water. Apparently, no department is responsible for this upland area, or for another critical land area—the riparian zone (along streams running through the city), which is a frequent site of intense agriculture.

Active environmental planning occurs in other ways in Bandung. For instance, the Parks Department, described above, plays a role in public education for maintaining green areas, and administers a greening program. Kampung improvement programs, which include the development of infrastructure, and education about river management, benefit the urban environment. Non-governmental organizations (NGOs) working in different areas such as economic development and environmental research and awareness help to promote conservation practices.

Institutions work with communities toward environmental action. For example, researchers at PPLH (the Centre for Environmental Studies at ITB) have helped waste collectors ("scavengers") organize their activity into a profitable venture in which garbage is separated and developed into various salable items, such as compost, recyclable metals (interview, PPLH researcher; Poerbo 1991). Others are doing action research projects on community participation in environmental management, through, for instance, neighbourhood management of local waterways (interview, ITB, community development planner and researcher). BUDP staff work with neighbourhoods in Bandung on projects through the local government bureaucracy and the mosque. BUDP staff go from door to door in order to communicate and organize around specific issues, such as sewage systems and water use (interview, BUDP director). Researchers at IPB (the university in Bogor) are investigating the design components for healthy and sustainable urban areas (interview, environmental management researcher, Bogor). For those involved in the above areas, the support of the community is seen as crucial to the preservation of the environment (interview BUDP director).

The different levels of government as well as NGOs are aware of the need for environmental protection. The Ministry of Population and Environment has environmental standards and guidelines that are to be put into practice by the lower levels of government. There is also a

newly formed national environmental protection agency, but it is poorly staffed and has a very small budget, making it difficult to enforce environmental standards (Stackhouse 1994, A9). At the provincial level, there are decrees and guidelines regarding environmental issues, and a number of agencies and institutions exist to implement them. However, with priority still being given to economic development and short term profits, and with a lack of cooperation between these agencies and institutions, it is difficult to deal adequately with the long term impact of development on the environment.

5.8 Transportation issues

The municipality's main road system is now used to its full capacity, yet if present trends continue, road traffic will double by the year 2006 (UDS 1990, Roads and Transportation 1-2). Of total traffic volume in 1989, private cars made up 36% of the total traffic volume. Public transportation made up 19% (colts 17%, buses 2%), while it provides for over 50% of daily passenger trips. Trucks also crowd the road, with a daily total of 79,400 truck movements, and with a yearly 5.3% increase of the total volume of goods shipped by truck (ibid., 1). The increasing traffic and pollution is due to an increase in vehicles, the use of leaded gas, and the amount of time cars spend idling due to slowed traffic.

The reaction to recent road building in and around Bandung shows how the transportation network affects the spatial patterns of urban activities. For instance, two ring roads skirting the city built over the last ten years were to have served the purpose of offering an alternative to traffic, allowing it to bypass the city or access it more easily and quickly. The land adjacent to these roads was to be reserved for industrial use. However, the open space alongside these roads was quickly converted to a residential and small businesses area, benefiting from the proximity to a transportation route. Some of the poorer inhabitants are using the land available in the "wedges" between the major roads to produce food. Developers have taken

advantage of these roads to build "real estate"¹¹ housing on rice fields in adjacent areas. The presence of these inhabitants has added to the amount of traffic on the road. Some farmers who have refused to give up their land for this development now continue their enterprise in the middle of suburbia. Farmers who continue to work on the outer edges of the freeway may face the same prospect of eventually being surrounded by such development.

5.9 Constraints and opportunities for food production

The urban factors discussed above, along with an analysis of interviews with food producers and city officials, pose a number of constraints and opportunities for food production in Bandung. These factors are discussed below and summarized at the end of this chapter Figure 8. The distinction between the city system level and the food producer level is made in order to separate food producer concerns from the city management perspective.

5.9.1 City system level constraints

Capacity of municipal government

Although there are municipal Departments of Agriculture and Environment, their main role is the monitoring of agricultural production and changes in the environment. In general, municipal agriculture extension services are not directed specifically toward the issues surrounding food production in the urban setting. Meanwhile, food production on the urban periphery, outside the municipal boundary, is under the jurisdiction of the regency's Department of Agriculture, which does not have a mandate or the ability to deal with the urban problems affecting these food producers. The municipal Department of Environment does not have a mandate to protect or coordinate resources in the urban setting.

¹¹ "Real estate" housing is characterized by low-density suburban style development.

Capacity of neighbourhood administration

Local administrators have little control over the development in their areas. When they are appointed to their position (by the Mayor or by the next official in the hierarchy), they are given a manual which outlines their duties and a land use map of the area by the municipality. If there are problems, such as with water provision or waste removal, people can report these to the administrator, who then enters a report in a hierarchical referral system until it reaches the appropriate desk, a process which can take some time. Administrators may not have the experience necessary to cope with changes in their neighbourhoods. For example, in Dago, an area which is urbanizing very quickly, the *lurah* (administrative head of *kelurahan*) is from the rural, not urban, community. He indicated that, while he is familiar with the condition of those living more rural lifestyles in the *kelurahan*, he does not interact a great deal with the urban residents, which is the sector that is changing the direction of his community.

Urbanization trends

Urban land uses, including residential development and recreation areas (such as golf courses), are displacing food production activities. Meanwhile, many urban dwellers hold the perception that "significant" food production does not and cannot happen in an urban area. There is also a perception that food production is a marginal activity, which can be replaced with "urban work" (for a cash income) when the land runs out or when the land rights are sold or appropriated.

Implementation of spatial planning

Although spatial planning occurs, implementation strategies are lacking. For example the present zoning covers wide ranges of uses, and where it is more specific, it is not always enforced. Areas that are considered "urban" require building permits; however, there seem to be many cases where these are waived for development. The areas within the municipality

considered "rural", even if adjacent to urban usage, typically do not require building permits for development. One administrator of a mixed use (urban and rural) area predicted that, in 15 years, all the land presently in agricultural use in that area would be used for housing (interview, Palasari).

Infrastructure development

1. Roads

The increase in land dedicated to roads in some areas of the city is decreasing the amount of available agricultural land. In other areas of the city, lack of adequate transportation routes makes some aspects of urban food production difficult. For example, food producers on the periphery of the city are often faced with poorly kept roads which need regular maintenance because of the damaging effects of heavy rains on steep slopes and grades. These food producers lack the cash to buy the kind of vehicles needed to negotiate these roads for taking their produce to the city market. For other areas, there are no roads, only foot paths, or, if there is a road, there is no public transportation. The lack of quick transportation to market poses difficulties for bringing produce, such as vegetables or milk, to market while they are fresh. These food producers must continue to rely on the "collector" to bring their produce to market.

2. Water

In recent years, ground water has decreased in availability due to competing urban uses and development of upland areas. Industries, such as garment factories, draw heavily upon the available water supply. Some factories have worked out agreements with the neighbourhood in which they are located regarding shared water use, but this benefits mostly residential users. A lowering in the ground water table causes problems for food producers using wells to water their crops.

Some food producers who are close to rivers or streams divert water from these sources; the smaller water bodies, however, may run dry in the dry season. In some areas of the city, storm water is diverted through concrete channels from the roads (in order to avoid flooding lower down) into adjacent areas where it can be controlled to water fields as necessary. Those who rely on wells must water their fields by hand. The kind of crops grown as well as crop rotation are adapted to the availability of water; in some cases, crops are simply not planted in the dry season. Some food producers depend on the municipal water distribution company, PDAM; it was not observed whether this source could provide an adequate water supply. Where wells are dry, rainwater and spring water, when and if available, are used for watering fields, as well as for household use.

3. Solid waste management

A formal waste collection system exists in some areas of the city. However, in many areas, especially those removed from the main roads, or in less affluent areas, waste collection and disposal are carried out by the informal sector. Examples of both efficient and inefficient informal sector waste management were observed. For instance, in Negla, waste which had just been transported to an intersection was burning in a neat pile and tended by two people. In Palasari, however, flies were hovering over waste, which appeared to have been there for some time, piled above and beside the house water pipes. Also, sewage systems are adequate in some places but in many areas they are not. When used beyond capacity, sewers back up, running into creeks and rivers whose water is taken for household use.

Urban pollution

All the usual pollutants from urban activities which can affect food production are present in Bandung, including groundwater and soil contamination, effluents in streams and irrigated areas (such as sewage; chemicals and dyes from factories), air and noise pollution. Bandung

is hemmed in by mountains to the north, south and west, so that the air pollution hangs over the city in a tangible haze.

Soil stability and quality

The increasing amount of critical land developed for housing or agriculture means a decrease in soil stability. When development occurs on steep slopes, the soils are threatened by heavy rains. Some food producers mentioned problems of soil contamination by metals or fluids, although they did not always know the source. In some upland areas, the soil quality itself is poor; yet the people continue to depend on it for subsistence and market production.

Changes in food market structure

Although the current market structure does accommodate produce grown within the city, there are certain recent developments which may make it more difficult for the food producer to find an appropriate venue. For instance, the recently developed regional markets (such as Caringen and Gedebage) as more specialized and commercialized institutions are not oriented toward the local producer. In some cases, sellers of local food have adapted to this development by establishing a smaller, informal market next to the new, formal facility. Where urban markets do feature local produce there is often inadequate infrastructure, such as lack of water to ensure sanitary conditions; or roads to ensure public access; or buildings to provide a safe working environment. On the other hand, when this kind of infrastructure is introduced at these market places, the value of the area tends to rise, and market activities are crowded out by development. Other problems caused by urbanization include increased pollution, theft, and lack of space to set up market stalls.

Another venue for selling fresh produce is the illegal street market. An example is the large market at Jamika (in the southwest area of Bandung), a wholesale market which supplies the cart food sellers who go from door to door, as well as householders. Although "illegal", this

market is tolerated by the city (which charges rent for market space), and exists for approximately five hours (from one a.m. to five a.m.) every morning. The streets are cleared of the "informal" market activity by six a.m., making way for the traffic and formal trade.

5.9.2 Food producer level constraints

Impacts of urbanization

People interviewed mentioned more positive than negative effects of urbanization. Urbanization means increased access to facilities, institutions, and an increase in variety of income sources. However, urbanization also presents problems for food production. One of the problems mentioned was the decreasing size of plots of land. This means that the way of working the land used in the past is becoming more difficult. For instance, now that the pieces of land are smaller, it is not as efficient to use the water buffalo for working the land. If the land is terraced, the water buffalo can do more damage than good because the terraces are too small and fragile to accommodate such a large animal. Issues such as air and sound pollution, lack of water, and crowdedness were also cited.

Another effect of urbanization on food production is the movement of the next generation away from this activity. An occupation which brings cash income, for instance, means that there is less time for food growing, and enough money to buy the needed food. There is an accompanying trend of lack of desire to work on the land; it is seen as a "backward" activity, and poor people's work. Thus, traditional knowledge of food production shared over a wide group of people is being displaced by urban activities and tastes.

One commonly mentioned negative feature associated with urbanization was the decrease of community spirit in the neighbourhood areas. It was observed that people do not help each other as much as they did in the past. One person interviewed attributed this to demographic changes in the area; for instance, many rich people from other areas were building houses

here, and there had been an increase of student renters, whose stay is only temporary. Another discussed the change in lifestyle that "modern" living brings: people work farther away from home, have different time schedules, and have less time available to help neighbours. People have to be hired to help now, whereas before, they would help each other without being paid.

Agricultural inputs and methods

People producing vegetables for market, as well as rice for own-consumption or market, depend on an array of chemical inputs, such as pesticides and herbicides, which were introduced with the Green Revolution and supported by government agricultural extension services. Due to government policy, treated hybrid seeds are also in common use, although in certain pockets some farmers are still using seed from their own crops, or wild seed varieties. These chemical inputs can be detrimental, if used heavily, and over a period of time, to human health, especially in a high density area.

Community health can be endangered by farming inputs. For instance, in Palasari, through a development program, farmers are given credit to buy water buffalo to be used for milk production. However, the owners of these animals are now so busy taking care of the buffalo (giving them baths two times a day, finding grass for them to eat), that they are not able to do work in the community as they did before.

Access to credit

Although some programs do exist to make cash available to farmers, there are few services provided by the banks or government that will make money available to food producers or distributors. Where such programs exist, they are difficult to access because of the paperwork involved (causing problems for those who cannot read or write) and inconvenient because of time delays in delivery (interview, ITB instructor). Food producers and

distributors who do not have access to alternative lending institutions borrow money from friends or neighbours, or from money lenders (who charge a large amount in interest). The food business is such that cash is often needed immediately—by the food producer, to plant the crop, or by the food distributor, to buy food to sell for the day.

Irrigation organization

Organization of water supply, where it is available, may be a problem. In areas where land is held by a variety of owners, especially on slopes, and intensely farmed, it can be difficult to coordinate watering needs and schedules. Traditionally, whole neighbourhoods were structured upon the timing of the watering schedule, so that everyone would have enough water on time. However, with increased density and increased mobility introduced through urbanization, neighbourhoods are not as stable as they were, and people do not feel as great a sense of responsibility for each other. The pieces of land are held in smaller plots, and one person may own land in several areas. People, working as individuals rather than a food growing community, grow crops at different times, applying pesticides and fertilizer, and irrigating, at different times, potentially inconveniencing their neighbour.

Status of tenure

Although the issue of tenure did not seem to be presented as "problematic" by those interviewed, in many cases, many of those interviewed did not own their food producing land. Often they had sold the land and were continuing to use it for food production, and expected to continue to do so until the owner decided to develop the land. Sometimes just a portion of the land is sold to someone who wants to build a house. Land had been sold for prices varying from Rp. 100,000 / m² to Rp. 250,000 / m² (US\$ 50 - 125), depending on whether it is close to a road or not. Some expressed the wish that they had not sold the land when they did (ten to fourteen years ago) since the current price is much higher. However,

the incentive to sell is great, since money available now provides revenue for immediate needs and aspirations, such as education, house repair, and pilgrimage.

When asked what would happen when the development actually occurred, the response was that there were plenty of wage earning options available, such as driving a local transit bus, working in the factories, opening a small store, trading at the market. Many of these families already have a diversified source of income, in addition to food production. Others had plans to move to land held by family members, or rented out, elsewhere in Bandung, or to land owned in an adjacent community when development occurred.

People growing food on marginal land have varying degrees of tenure. For those with gardens beside the railway tracks, for instance, there is an agreement between the railway and the people involved that the land may be used in return for maintenance of the area. However, for those who are simply squatting in an area, there is no security of tenure, no matter how long they have been there; they can be, and are, removed when the land is needed. For example, squatters have been forced to resettle in order to satisfy the demands of wealthier inhabitants to have a park in their area (interview, senior planning consultant).

Knowledge of health and environment

A lack of knowledge of, and facilities for, composting, recycling, disposing of garbage was observed. In general, food producers expressed a lack of concern or knowledge about effects of pesticides on health. Where there are programs that can enhance quality of environment and life, there may be a lack of education or interest which inhibit the success of the program. For instance, one administrator noted that, although there is a greening program run through the neighbourhood office, it does not work as well as it could because people are uneducated about the benefits of planting trees, and so, unconcerned about the program. Or, if trees are planted, they may not subsequently be properly tended.

While there are traditional foods which are thought to be healthy or health promoting, there seemed to be little knowledge among those interviewed about their actual nutritional value. Thus, there may not be an appreciation for the nutritional advantages of fresh food.

5.9.3 City system level opportunities

Municipal government services

The municipal Agriculture Department and Environment Department have extensive information regarding food production and the condition of natural resources available. The Parks Department uses a consultative planning model in the process of park planning which can be used for designing community garden areas. In this system, design is proposed by the Parks Department; the Mayor is consulted for comments on the design; and the public may be surveyed for opinions, or can drop by the office to make (interview, Parks Department director). The city's active involvement in local economic development can be extended to the food production sector.

Institutional food producer support

Several organizations exist which facilitate the food producer's logistics. Many of these programs help groups of farmers in starting a project together; the farmers share the profit later. For instance, through the *Dinas Sosial Kotamadya* (PSM) farmers in Palasari were able to obtain 20 goats in order to start a herd. A small enterprise in goat raising was established; the herd now contains more than 250 animals. Another organization, the *Koperasi Unit Desa* (KUD, established by The Ministry of Cooperatives) is designed as a cooperative at the village level. KUDs exist in a number of Kelurahan, especially those with more rural characteristics, within Bandung even though they were designed for non-urban communities. The cooperative can act as both buyer and distributor. For example, farmers can bring in products, such as milk, to exchange for any of the "nine essentials" (as designated by

BULOG), or they can purchase from these stores on credit, and pay later in kind. The KUD then sells the milk to the Indonesian Association of Cooperatives. Half of the milk is made into powdered milk; half sold fresh.

Another type of arrangement run by the KUD helps the farmer start a business. For instance, the KUD may arrange for a farmer to be given a water buffalo, with the arrangement that the farmer will pay for the cost of the buffalo (Rp. 400,000; US\$220) from the profits of the milk, which can be done over three years. The mandate of these cooperatives can be enlarged to support urban food producers who face issues related to the urban setting.

Food distributors in Bandung also have access to alternative credit. A food seller's cooperative has been formed, serving the following functions: lending money to traders to set up stalls, or to buy the food they need to sell. The money is then paid back through installments, with a sliding scale of interest (interview, Bandung Food Distribution Cooperative). The food stalls visible everywhere in Bandung, coloured blue or red, are a result of this program. The food sellers can also organize themselves around their particular issues through this cooperative. Initiatives are also being undertaken to support streetfood sellers, and to increase knowledge about the health aspects of vending ready-to-eat food sold in public places, an important undertaking since streetfood provides for about 30% of the daily food intake of urban household in Indonesia (Streetfood Project 1992, 59). The success of the food vendor initiative for the informal sector is being noted in other areas of Java; the cooperative in Bandung is being consulted by planners in Jakarta.

Concerned citizens

Citizens are involved in activities involving the land and growing practices through the city's greening program, which organizes groups to plant, and take care of, trees. There are also neighbourhood greening programs, which encourage the beautification of gardens, the

provision of vegetative shelter, and planting that can supplement income. Citizens are involved in organizing education groups. For example, in Palasari there is a *kelompencapir*, an acronym which means, roughly: group / listen / read / view. This is a program from the Ministry of Information which was designed to improve the level of knowledge for the rural people; in some cases, these information groups have also been established for *kelurahans* which have rural characteristics, but lie near or within urban areas. The program's purpose is to improve the level of information among the people about agriculture, infrastructure, health and hygiene, sports, economic development (through making products such as soap), community organization, or anything that has to do with their living and habits. Members of the *kelompencapir* are always available to show visitors around, and to explain the functioning of the systems in the village.

Availability of land

At present, there is still land available for a significant amount of food production within and around Bandung. An official total of 6,061 ha of land within the municipal boundaries is listed as agricultural land. There are, in addition, many other open spaces, such as land beside railway tracks, in riparian zones, and around buildings which are used for food production. Some of this open space, which is available for development of parks, can be designated for community gardens. For example, a large piece of land has recently been set aside for this purpose in the city of Medan (North Sumatra) (personal communication, ITB student).

Market structure

Although the market structure is changing, there are still many venues for urban food producers to sell their produce. There are 65 markets in Bandung, providing direct employment for 22,300 people (UDS 1990, 10.7-8).

Climate and soil conditions

Favourable conditions for food production exist in most areas of Bandung, which has been nicknamed, in the past, the "flower city", or the "garden city". The adage about Java is that a stick can be thrown anywhere, and it will take root, grow and produce fruit. Since both upland areas (in the north) and flat plains (in the south) exist within the city, the opportunity exists to grow a wide spectrum of food, from rice (on the flat fields) to vegetables (in the hills, since they do well in a somewhat cooler zone). The abundance of water (flowing through the city from the mountains) makes local fish production popular.

Research initiatives

An interest in food production in urban areas exists in Indonesia. Several nation wide conferences (1985, 1991; conference proceedings available) have been held to explore the potential for food production and suggest strategies and policies to enhance this activity. Research has been presented at these conferences on such topics as alternative, intensive food growing methods such as hydroponics. Research has also been done on other intensive food growing techniques, such as home gardens (Christanty et al. 1985, Stoller 1978, Anderson 1986) in Indonesia. Other researchers are developing studies on the role of vegetation in the city system such as determining the optimal amount, and appropriate spatial distribution, of trees needed in Jakarta to absorb that city's urban pollution and mitigate urban heating (interview, Bogor University researcher). NGOs are taking an interest in alternative pesticide management (interview, Pesticide Action Network), as well as other urban environmental issues. Research has been called for on nutrition studies that compare the health of gardening and non-gardening households, and for developing a framework for evaluating the impact of gardening projects (Brownrigg 1985).

5.9.4 Food producer level opportunities

Urban living

Most food producers interviewed expressed the opinion that urbanization has improved their quality of life. Urban growth presents more opportunities, such as better transportation facilities; ease of food distribution; access to farming inputs; access to other income earning opportunities; the proximity of institutions, such as schools; in short, many of the benefits of a "modern" lifestyle. Where urbanization has not had a detrimental affect on community spirit, *gotong royong* (mutual help), such as through helping with planting or harvesting, is still being practiced.

Food producer organization

In some areas, food producers have organized themselves in order to start an enterprise, or to deal with a crisis. For instance, a number of the diversification projects have occurred in Palasari. Farmers began with contributing their own capital to the project, then sharing the profit from the project. Food growers have also cooperated to work through a crisis. For instance, in 1991-92 there was a drought in Palasari. With the help of an agricultural lecturer who lives in the community, the farmers organized to plant 3,000 water conserving trees (fruit trees), which were provided by the local administration. The farmers now keep the profits from the fruit trees.

Food production knowledge

There is a wealth of knowledge, often blending both traditional and modern techniques, about food production. Food plays a large role in cultural expression of the Sundanese people, as well as for those who have migrated to this area in the extensive rural-urban migration in the past few decades. Many food producers still use traditional cultivation practices (hoes, harvesting by hand), which are suitable for the increasingly small plots of land within the city. Conservation practices such as diagonal tilling and intercropping (to save space and as

natural insect controls) are evident. Some food producers take advantage of animal and human waste for fertilizing their fields. Foods and herbs are still valued for medicinal properties. The *apotik hidup* (living apothecaries) and *warung hidup* (living stores) gardens appear in private gardens, community courtyards, or in large flowerpots placed on windowsills and rooftops.

5.10 Conclusion

At present, according to observations and interviews, there appear to be more constraints than opportunities for food production in Bandung. Urban land uses seem to be ascendant; an "urban bias" was often expressed against "rural" activities within an urban setting. Zoning does not serve the purpose of protecting land for certain uses. Herbicides and pesticides continue to be used on land adjacent to areas of increasing density. Pollution and densification are increasingly affecting the viability of food production activities.

However, a number of opportunities are in place for the support and development of food production in Bandung. Many of the urban dwellers who are food producers still have the knowledge, motivation, and lifestyle that accompany this activity. Even those who do not produce large amounts of food for market, or food for subsistence purposes, have some knowledge of growing plants for medicinal or ornamental purposes. The continued existence of village style markets offers a venue for selling locally produced, fresh, unprocessed produce. The institutions necessary to support and implement urban food production are all present, from local government and city management, to neighbourhood cooperatives and local educators. The opportunities still exist to set aside land for community gardens, as well as to preserve land currently under food production.

The constraints and opportunities discussed in this chapter are summarized below in Figure

8. These are the issue areas upon which the recommendations, which follow in the next chapter, are built.

Figure 8. Constraints and Opportunities for Food Production in Bandung

City system level constraints	City system level opportunities
<ul style="list-style-type: none"> • Capacity of municipal government • Capacity of neighbourhood administration • Urbanization trends • Implementation of spatial planning • Infrastructure development • Urban pollution • Soil stability and quality • Changes in food market structure 	<ul style="list-style-type: none"> • Municipal government services • Institutional food producer support • Concerned citizens • Availability of land • Market structure • Climate and soil conditions • Research initiatives
Food producer level constraints	Food producer level opportunities
<ul style="list-style-type: none"> • Impacts of urbanization • Agricultural inputs and methods • Access to credit • Irrigation organization • Status of tenure • Knowledge of health and environment 	<ul style="list-style-type: none"> • Urban living • Food production organization • Food production knowledge • Multiplicity of economic opportunities

CHAPTER 6

Recommendations

for Food Production in Bandung

6.0 Introduction

These recommendations are formed on the criteria that they can be introduced through the opportunities available in Bandung. It is stressed that any initiatives will have more effect as people-focused, community development-, and project-oriented planning, given evidence of projects that have succeeded in the past in Bandung.

6.1 General recommendations

Determine the goals of supporting urban food production

Various reasons exist for supporting this activity, from promoting community and household self-reliance, to encouraging a less built-up urban area, to managing the urban environment. Clarifying the goals for supporting this activity will create more effective planning strategies.

Recognize the activity and benefits of food production within the urban area

Recognition by urban management of the existence of urban food production, both large scale and garden size, can introduce this activity into urban policy considerations. Awareness of the benefits of food production within the city provides a basis for developing an effective support program. The benefits may range from soil reclamation and conservation, to an ensured supply of locally produced fresh food, to adding to urban green space in order to mitigate urban heating and pollution effects. An increase in the awareness of the nutritive value of fresh produce can affect the demand for locally grown food.

Increase awareness of urban impacts on natural resources

Information about the connection between causes for changes in the environment and the impacts of these changes on people's lives can lead to better decision making about urban activities. Some of this kind of information is already being made available through the actions of municipal offices, such as the Parks Department, through its extension workers whose job it is to educate the public about the role and care of parks.

6.2 Planning Interventions

Coordinate relevant government departments

The Municipal Department of Agriculture and the Municipal Department of Environment can coordinate to share their data and plan strategies. At the same time, their mandates can be expanded in order to act on this information for the support of food production. The Department of Environment, Department of Agriculture, and Parks Department can interact in order to determine the appropriate use of remaining open spaces in the city. The Departments of Agriculture from Bandung Municipality and Regency, as a part of the mega-urban region planning strategy, can together develop policies and services that benefit food producers both within and outside the municipality who are affected by urban impacts. Finally, regional and local administrations need to be aware of national food policy in order to plan effectively for urban food production.

Develop environmental planning capacity

A comprehensive environmental plan can be designed in order to plan for the desirable amount of built space, capacity for density (given land and water resources), as well as for urban food production. Such an environmental plan can be based on a directed analysis of the already existing information about the status of urban environmental resources (cf. Soerjani 1992), as well as on the information yielded by the assessment grid (Figure 6).

Extend support services to food producers and administrators

Financial, informative, and training inputs for urban food producers can be introduced by local government. These activities can also be planned and managed by a cooperative of the kind that exists for food distributors. Giving neighbourhood administrators the capacity to deal with impacts of urbanization (such as densification, changes in land use, increase in pollution) can help them to coordinate the development of their neighbourhoods with the development of the city.

Include food production in spatial planning

Food production areas can be preserved if suitable land is set aside for it, and development is centred in certain locations. More land will be available if residential areas are not low-density, and if factories make economic use of space. Infrastructure planning, through the upkeep of roads; the coordination of water use; development of well-placed distribution centres (markets); and the support of public transit, all support urban food production. The assessment grid (Figure 6) can be used to determine the role of food production in different areas of the city.

Various urban management measures can be used to implement these spatial plans, such as the enforcement of zoning, the review and monitoring of tax and permit systems, and the clarification of tenure issues. This kind of physical planning can also enhance the interface between the urban and rural areas. If this is not done, unwelcome situations may develop on both the regional and urban levels. At the regional level, rapid growth may cover the best farmland; at the urban level, those who depend on open space on the periphery or within the city may be left without a means of subsistence.

Include food production in urban economic planning

Local government can help to set the stage for economic development through food production through a number of means, such as promoting cooperatives (for education, provision of cash at important input times during the crop cycle); introducing diversification strategies (developing agriculture products for the urban market); raising awareness of, and pride in, locally produced food; facilitating access to means and resources for food production; and diversifying venues for marketing food distribution.

6.3 Direct Interventions

Improve neighbourhood food production capabilities

Food production programs can be designed to be used by people who desire to improve the food production capabilities of their neighbourhood. These programs can be supported by community groups and NGOs. These groups can do work in interviewing, collecting data, and educating producers and consumers. These programs can include community gardens or garden plots on land that has been set aside for this purpose within or near the urban area. Community gardens may be especially welcomed by residents of the new multi-storey housing projects which often remove the opportunity to grow a garden.

Conduct research on urban food production

Research in the following areas will yield information for designing policy to support urban food production in Bandung: assessment of the impact of urban effects (such as pollution, water depletion) on food production; development of food production methods adapted for the urban setting (hydroponics; intense, chemical-free growing methods); identification of foods appropriate for the urban setting (considering, for example, the different implications of rice fields and vegetable plots); identification of the key players in the food supply chains; identification of the types of support needed by these food producers and distributors; assessment of changing dietary needs and preferences caused by urbanization.

6.4 Policy directives for urban food production

A number of policy directives are included as a basis for both the above recommendations, as well as the possible alternatives. They can be used as guidelines for program development, or for tailoring existing regulations and facilities for urban food production. These directives are drawn from a combination of the literature on urban food production, and the observations made during the study.

- 1) Ensure food producers' access to necessary resources.
- 2) Take away punitive measures or inhibitive factors to using land for food production.
- 3) Plan for urban food production in a way that recognizes the reality, and coordinates effects, of different land uses within and around the urban area.
- 4) Consider urban food production as part of the urban environment, using and supplementing natural resources.
- 5) Use existing knowledge and institutional structures to support urban food production.

6.5 Conclusion

While urban food production in Bandung currently provides income and subsistence to a significant sector of the population, its future is tenuous given present trends of urbanization. One of the immediate problems is the decline of available land within as well as around the city for food production. Other problems include declining stock of the necessary resources, such as clean water and air. Observations and interviews show, however, that people in this area are likely to continue food production for as long as it is physically possible.

Given these converging trends, the continuation of urban food production in Bandung, as well as the exploration of its further potential, depends on institutional support. There is much that can be done to deal with these challenges through existing government and city

management structures. In addition, the potential exists for the wider introduction of other aspects of urban agriculture, such as the recycling of organic waste.

If, on the other hand, urban food production is not recognized or given institutional support, it is likely that the pressures of growth and urbanization will force its discontinuation. The prediction is that, given present trends, land available for the larger scale urban food production within the city will be at 2% in fifteen years. Planners and local government will need to decide whether this is the desired direction. Impacts associated with the decline of urban food production include: an increasing separation of urban activities from urban environment; increased built space; displacement of people for whom food production is a livelihood; discontinuation of access to resources for people living at subsistence levels; increasing distance between the rich and poor; decrease in availability of locally produced fresh produce; and diminished capability for sustainability in the urban area and region.

The rationale at the local level for supporting urban food production may be augmented by considering regional effects. Food produced within and around cities can help develop an integrated economy, where "income and employment growth in rural areas and neighbouring towns are mutually supportive" (Firman 1992, 106), between the quickly merging urban and rural economies and living spaces. For instance, technical support developed specifically for urban food production may be of relevance to the more rural areas which are also impacted by urban effects, such as pollution and decreasing water sources. Given Bandung's environmental resources, and the nature of its expanding population and economy, the city is currently in a unique position to develop the potential of its urban food production.

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