Urban/Peri-Urban Agriculture:

Status and Challenges in Taiwan

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ABSTRACT

Adverse environmental effects such as air pollution, water pollution, heavy metals, and other pollutants have threatened the viability of agriculture in the urban area. Better paying employment opportunities in the urban area have been pulling the young labors away from agricultural sector in the rural area, and the incentive to convert for non-farming uses are high. The status, the experience in the densely populated island state of Taiwan, the challenges and prospects for the development of urban/peri-urban agriculture, and the policy implications are investigated in this paper.

Keywords: protection of agricultural resources, competitive resource use, institutional arrangement, agricultural policy

INTRODUCTION

Background

Taiwan, as an island state, has been recognized for its well-established infrastructure in agriculture and excellent research and development efforts as well as agricultural extension services rendered by the public and the private sectors. The ability to convert an agrarian based economy to the industrialized one has its price to pay. The environmental Kuznets curve (e.g., Dasgupta et al., 2002) of presenting a reversed U shape to depict the relationship between the pollution intensity and income level of the economy is well suited to describe the experience in Taiwan.
As the income level increase, not only that people are more aware of the environmental pollution problems, but also that such interest is connected directly to the food quality and food safety concerns. The agriculture sector is vital even in manufacturing based economy that it served as cushion during the economic down turns. Now that the industrial structure has turning its way to becoming a service-based economy, new innovation in agriculture is observed and appreciated; for the recognition that agriculture is more than about food consumption. It is about natural resource and people, and it is more than natural resource and people. It is attractive to see the rural scenery even though we know that what we observe is not the sole work by the nature. The irrigation system, the wooden bridges over the streams, the crops, and the animals strolling on the land are all contributed by human hand, yet we call it how “natural” it looks. Where as when we concrete, standardized work of steel, we feel the coldness of the industrialized world; and we call it “artificial.” Agricultural operation and rural scenery is as artificial as the forest of concrete, but what differentiates them is the fact that the common knowledge that there is much less control humans have in the rural scenery and the farming operation. Inside of the irrigation system, there are lives in there; not what did the human hand plan for. There will be weed, wildflower, insects that survived human interferences with the nature, and become lively.

Seeking for more harmonious co-existence with nature is the biggest challenge, and the ever-popular ecological engineering philosophy and experiments is one of the examples. Bringing the nature to the jungle of the concrete buildings in the cities would be another big challenge.

With an overwhelmingly high population density and growing industrial sector, the competitiveness of the agricultural sector for the resources has been threatened. The most recent results from the 2000 census information of Taiwan (Director-General of Budget, Accounting, and Statistics, DGBAS) shows that there were 8.5% of the labor forces engaged in agriculture activities, while 60% of them were over age 65. The aging problem in agriculture is very serious.

In terms of source of income, the income from agricultural source for the farm household is only 21% in 2004 (http://www.stat.gov.tw/public/data/dgbas03/bs2/si/s013.xls), while the average disposable income per household for the farm household is only 80.5% of that of the
non-farm household (http://www.stat.gov.tw/public/data/dgbas03/bs2/si/s012.xls). On the other hand, urban sprawl into the rural area is a common phenomenon. The census report for 2000 (ROC National Statistics) indicated that with the population of 22.3 million, the population density has reached 616.3/Km$^2$, compared to 498.0/Km$^2$ in 1980 (http://www.stat.gov.tw/public/Attachment/41171663571.rtf). According to one definition of the urbanized area (DGBAS) with the population density of over 300/Km$^2$, then virtually the whole island of Taiwan could be classified as the urbanized area. The population lives in the metropolitan$^1$ area has reached 70%, while 65.3% of the residents the 5 main metropolitan$^2$ areas. The biggest Metropolitan area is Taipei-Keelung with about 30% of the population lives there. It contains Taipei Municipal as the central city along with 28 other cities and towns as the satellite cities. The next largest one is the Metropolitan area of Kaohsiung includes Kaohsiung Municipal as the central city along with 17 other cities and towns, which composed of 12% of the population. The most densely populated cities are Kaohsiung Municipal (9,725 people/Km$^2$) and Taipei Municipal (9,655 people/Km$^2$). It was the first time Kaohsiung topped Taipei Municipal.

With all these challenges, is there a new role of agriculture in the urban/peri-urban area? This would be an issue for further investigation.

**Objective of the Study**

Planning for agricultural production to provide the urban need has a long-standing history. The issues of urban/peri-urban agriculture is of particular interest to many parts of the world in that there are many dimension of the issues that is of relevance: such as food security, long term sustainability or viability of the cities, to raise a few. It has everything to do with the urban planning, rural planning; the land and the labor policy, food policy, environmental policy. The question that should be raised is that whether we need or it is affordable to have agricultural activities in the urban area? And in what form is the desired way of development in urban agriculture. Should we make the urban area a self-sustaining unit in terms of food production or what are we seeking for other functions from agricultural activities in the urban area? Is the market mechanism capable of reaching an equitable and efficient allocation of

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1 The metropolitan area is composed of one to two central cities and several satellite city or towns; and the metropolitan area is named after the central cities as defined by the Office of the Director General of Budget, Accounting and Statistics of the Executive Yuan, Taiwan ROC.

2 The five main metropolitan areas include: Taipei-Keelung, Chungli-Taoyuan, Taichung-Changhwa, Tainan, and Kaohsiung. There are two other secondary metropolitan areas.
resources from that aspect?

To understand the urban/peri-urban agricultural situation, the study focuses on the Kaohsiung metropolitan as the case for the main part of the discussion. One of the reasons is that the Kaohsiung is located in the Southern Taiwan, which is regarded as more proximate to rural areas. With the ongoing sprawl of the urbanization process, it is of interesting to further investigate the issues of relevance.

CURRENT STATUS OF URBAN/PERI-URBAN AGRICULTURE IN TAIWAN

The primary role of agricultural sector is to for food production. With 70% of the population reside in the metropolitan area; the issue of whether enough food could be provided through the sector is worthy of investigation. As pointed out by Midmore and Jansen (2003), in many developing world, lack of cool storage transportation has kept the vegetable production areas nearer to the major consumption area. However, the modern convenience of transportation network and logistics services provided by several competing transportation companies and the cool/cold storage and transportation availability has created a completely new picture of the circle of activities in Taiwan. Fresh vegetables and fruits are quickly collected and distributed to retail mega market chains at least once a day. Ornamental flowers and specialty fresh cut flowers produced on contractual basis could also reach the customers in the hotels and business groups located inside of high-rise buildings within several hours. People who live in the urban area with higher income level than those in the rural area, and with a lower Engle’s coefficient, they are able to pay more for the priciest food items. The food could come from the nearby farms, the vegetables and tea grown in the high mountains, where the cool climate enable the farmers to produce the products that are available only in the template zone, and to avoid the problems with pests and humid climate down on the plains (Midmore and Jansen, 2003).

The food self-sufficiency ratios measured by energy has declined from 37.5% in 1995 to 32.1% in 2004; while the measures weighted by price has steadily declined from 85.3% in 1995 to 75.1% in 2004. Not surprisingly that rice (88%), vegetables (89.7%), fruits (87.6%), pork (92.1%), eggs (100%) and fish and seafood (172.3%) still exhibit high level of self-sufficiency, according to the Taiwan Agricultural Statistical Year Book (Council of Agriculture, www.coa.gov.tw). However, compared with a decade ago, only fish and seafood enjoyed increase in self-sufficiency, eggs stayed the same, and all other major items have declined.
The Productive Environment of Agriculture

1. Water

Even though the GDP from primary agriculture production is 1.7% in 2004, the water usage by the agricultural sector is maintained at about 70% in Taiwan. The irrigation system is maintained by the Irrigation Association (IA), however, in the cities even though the IA has the ownership of the irrigation system, but in the cities, some of the irritation drainage has already heavily polluted with untreated household sewage industrial waste water, which can no longer being used for irrigation. In some cases, the irrigation system is used purely as drainage is covered and converted to part of the road system. The trace of that can only be viewed from historical record or monument to commemorate the existence of such system.

In the case of Kaohsiung City, there is no independent irrigation association

2. Land

Kaohsiung is a harbor city with 88% of the land area in plain area (Kaohsiung Municipal Government, accessed through [http://www.kscg.gov.tw](http://www.kscg.gov.tw)) which make the land development into residential area, industrial use, or commercial use much more viable and the competition of land use severer. The arable land in Kaohsiung Municipal has steadily declined from 6.69% in 1988 (1,027 ha) to 3.67% (564 ha) in 2004. The population engages in agricultural activities is less than 1% (0.94%), and the value of the land based production of farming and husbandry is US$355 million, excluding the fishery sector (the fishery sector, with product value of US$16 billion, contribute to 97.86% of the value of agricultural products.).

3. Labor/Farming household

The percentage of farming household has declined steadily; in 1956, there was 44% of the household in the farming sector, while there was only 10% of the household in farming in 2004.

With population of 1.5 million people and population density of 9848.63 in 2004, 537,377 household in Kaohsiung; the fishery household consists of 5% (27,557), virtually all of the other fresh agricultural produce has to come from out side of the city. In terms of demand, with 1.5 million of population and the per capita income of US$33,368, and disposable income of US$26,594, with an Engle’s Coefficient\(^3\) of 25.31 the ability of consumption cannot be ignored in Kaohsiung Municipal. And as

\(^3\) Engle’s Coefficient is calculated as (Food and Beverage Expenditure)*100/Total Consumption Expenditure.
we moves away from the municipality and into the peri-urban region of the Kaohsiung Metropolitan area, the picture takes a different shape. Among the 17 satellite cities and towns, Fongshan City has the highest population density, and it has the lowest percentage of land area harvested with the total available cultivated land area. Only 24% of the cultivated land area was planted and harvested for all crops in Fongshan City in 2004, where as in other townships, the level of farm use intensity for agricultural purposes are higher\(^4\). The role for the supporting services to the central city is apparent.

Even with urban expansion, the institutional infrastructure such as administration of agricultural policy in the public sector, and the farmers’ organizations that some of them even in existence for a century still provide backbone to the marketing of agricultural products and supplying agricultural inputs. The Farmers’ Associations in the urban area faces the declining full membership farmers, and is increasingly facing the demand of their associate members, the competition from other financial institution such as the commercial bank posed a threat to the operation of the credit departments.

**CHALLENGES OF AGRICULTURE IN THE URBAN/PERI-URBAN AREA**

It is a matter of perspective whether we should treat the issues as challenges or opportunities; but at times it is also the matter of whether we could find creative solutions to it. Nevertheless, the viability of agriculture in the urban/peri urban area would largely be the issue of the economic mechanisms, the joint effort of the stakeholders, and the will of the government for implementing public policies for supporting/discouraging such practice. However, the will of the government should be a reflection of the desire of the public in a democratic society.

What we expect to see in the future landscape of the cities? Will agriculture be part of that picture, and in what form? Theses are the challenges that we face. Cities are not isolated existence from the rural area.

Aging population in agricultural sector is a common issue. From the community’s perspective, aging is a greater problem because the young population has been drawn to the cities, partly because the rural area is unable to provide enough

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\(^4\) The figure is calibrated from the Kaohsiung County’s statistic tables from www.kscg.gov.tw.
income opportunity as in the cities, while partly because of the social or entertainment options available. While for the urban area, the shortage of labor would be a matter of time wise, not necessarily in complete short supply. Flexible working hours to accommodate for the supplier of labor force, and the diverse demand of the consumers is becoming the norm in urban areas. Therefore, there might be opportunities for people seeking for income from the existing business environment to look into innovative way of making a business in urban agriculture for generate secondary income for part-time or leisure activities for weekend farmers: this option is not viable for the purely rural environment. Due to the sky racketing land and housing prices and over crowdedness, some people are seeking for living the peri-urban area while enjoying the various conveniences in the cities. They will be the potential participants to the program for peri-urban agriculture.

Slow moving farm vehicles on the road. Foul smells from animal production units causes public nuisance. Unless there is a designated area for agricultural production, and there is a certain distance from the residential area, the proximity of such operation would easily attract objections from the neighbors, and causes public health concerns as well as subject to compliance with air pollution and water pollution regulations.

It is common memory for many people grown up in the small town on the commercial district to observe the changing structure of the economy in Taiwan. The front of the townhouses on the main streets was connected. The extended roof over the sidewalk provided the passing by people with shelters from the sun and sudden rain shower. Some of the houses used the front part facing the main road to operate as small shops, and some simply had the door wide open for the guests of the house to come and go easily. While in the backside, it was not uncommon to have a small plot of land for raise two pigs, several laying hen, and a small parcel of land for growing vegetables. The faming operation, or maybe called it home gardening, was usually taken care of by the female members of the household, usually the housewives who did not have outside employment, and perhaps the children, while most of the rest of the family members had full time jobs in the town, or run the family business at the front. The male member of the family might be called to help when there were other than the daily chore to take care of. The pigs were usually raised for supplementary income, especially for schooling. The eggs for the rare supplementary sources of protein would be given to the needy people, the elderly, the school lunch, and the sick ones or the working ones. Poultry would be consumed only if there was a special occasion for ceremonies and festivals. The family might even have a parcel of land in
the rural area that produces rice, bamboo shoots, fruits or tea. This would be a
depiction of a common household on the well off half of the population.

At the corner of the street, there might be a partially opened (for ventilation) pig
house with more than a few (say 15) pigs inside for a commercial operation. On the
side of that, there might be even people kept a flock of chickens or turkeys. The foul
smell usually came from that kind of operation. Sometimes, the birds would fly out of
their captivity and chase small school kids walking near by. The untreated waste water
discharged directly into the very shallow drainage ditch along side of the street.

This kind of phenomenon can no long be observed that often on the street corner
of the small towns anymore. Even the design of the old streets can be observed in
limited quantities only on the restored areas of some of the old towns. What had
changed was multifaceted. The economic incentive of converting the pig house into
something more profitable options (a shoe store in this case) and at the same time
decreased the nuisance associated with it. Water pollution regulation has been in place,
which further decrease the incentive to run faming business in the commercial area.

What that change had brought about was the disappearance of the related
business. At the development stage that all people whether they in the urban area or in
the rural area, they engages in at least partially in agriculture related activities. When
people used to raise their own chickens for festivals and ceremonies, the businesses of
incubation facility to hatch the chick was right down the street. When there is constant
need for seedling and small quantities of fertilizers and chemicals, there would be one
selling farm supplies within the walking distance only a couple blocks away. It would
be very close to the traditional morning (or afternoon, depending the habits of the
residents) retail markets where buyers and sellers of agricultural products and other
food items come together every day. There were also stores selling farm inputs, rice
store selling rice and other oilseeds, feeds, and other cereal products. In many places
the morning or afternoon market is still there, but the incubation facility, fertilizer and
other input stores had long gone.

This is all part of the consequences of economic growth where the opportunity
cost of running such operations at the center of the cities has becoming expensive.
Therefore, even though the urban area provided close approximation to the final
consumers, however, the unit revenue from agricultural still cannot compete for the
land use options from outside, and conversion is surely in place, and the related
industries such as farm supply, incubation facilities surely enough to have moved
away with the agricultural sector. This is a shared experience as the residential/commercial area of the city expanded in many of towns as the satellite cities of the metropolitan area.

Air pollution (e.g. Agrawal et al., 2003), water pollution, competing use of water, high rising cost of land for operation all present potential threat to the viability of agricultural in the urban area; small scale operation/capital intensive facilities:

The positive externalities associated with agricultural activities include the ability to adjustment of the microclimate to regulation the temperature (e.g. Yokohari et al., 1997), to provide open space and to facilitate infiltration of groundwater (e.g., Lin et al., 2001). Therefore, at the presence of positive externalities, there will be less incentive for the individual to provide enough of such services to the public that external economic incentives has to be provided. On the other hand, highly industrialized operation would generate income for the comestible with other sectors, but the ability to provide open space would not be possible. In such cases, there will be no need for the public interventions.

**POLICY IMPLICATIONS**

As mentioned earlier that the viability of agriculture in the urban/peri urban area would largely be the issue of the economic mechanisms, the joint effort of the stakeholders, and the will of the government for implementing public policies for supporting/discouraging such practice. The pursuing for long-term economic viability and survival of individual or firms, the efficient use of resources is the mean and consequence. The market mechanism takes care of that already. However, there is no doubt that we still not at ease about the consequence of let the market mechanism play its role for several reasons.

First of all, there are additional values associated with the produce we purchase from the urban/peri-urban agriculture activities that is not reflected in the market value. Therefore, there is no doubt that measures have to be taken to overcome the economic pressure for the “public good” that could be generated from activities in the urban/peri-urban agriculture. Viable options for urban agriculture should be addressed with the vision we have on urban landscape, and find that agriculture could have a new role to play in that picture. Agriculture is about natural resources (land plus the ecosystem), people (knowledgeable, innovative) and the cultural and social environment.
For the purpose of continuing to use agriculture in the urban serve as food providers, there has to be institutional arrangement made for the protection of the productive environment for agriculture in place for the sake of safe food supply. Encouragement on the adopting the idea of organic agriculture would be an integrated notion on the form of agricultures that is consistent with the urban environment.

In addition to the food security and safety concerns, the social function of agriculture could be stressed by promoting Agro-tourism in the urban area to use for multiple purposes. It could be educational demonstrations for schools, preservation of natural habitat at a micro level for land not suitable for food production. Small-scale community farm operated by members of the community could also provide open space and the scenery of crops rotations to enrich the landscape of the city.

Agriculture is a specialized field. Urban agriculture would have unique features to it that is has different agriculture in the rural area. With limited land areas available, the function of providing the greening scenery might need to resort to the top of the building. Apparently, it would require a different sort of input/output relation to it, and a different sort of infrastructure and agricultural services to it. Furthermore, just like other industrialized products, it is becoming more and more important talk about the agri-food chain, instead of talking about individual products or producers. The viability of the supporting businesses has to be there for the viability of urban/peri-urban agriculture.

REFERENCES


