

**The Birth of the Annual Grafting Pear:  
Peasant Household Economy and Agricultural Technology Innovation in Dongshi, Taiwan<sup>1</sup>**

**Shou-li Yeh**

Graduate Institute of Sociology,  
Tunghai University

“嫁接梨”的诞生：

东势的农民家庭经济与农业技术创新

叶守礼

**Abstract**

This article discusses the relationship between the contemporary Taiwanese peasant household economy and agricultural technology innovation, taking the economic development process involving the Dongshi annual grafting pear as an example. The “annual grafting pear” is the result of a fruit cultivation model pioneered by the peasants of Dongshi in order to overcome the constraint of climate. Temperate pears have a high market value, but raising them in a subtropical region comes at the cost of a several fold increase in labor. Although the government’s local agricultural extension station generally believes that growing annual grafting pears is not in line with the trend of modern agricultural development, peasants have stuck with this labor-intensive

---

<sup>1</sup> This article is the sequel to my “Transformation and Tradition in Taiwan’s Peasant Economy, 1960–2015: A Case Study of the Dongshi Fruit Economy” (Yeh, 2016) and also draws on my master thesis (Yeh, 2015).

fruit cultivation model. Today, annual grafting pears have become the mainstay of Taiwan's pear industry. Combining participant observation, oral history, and ethnography, this article analyzes the tensions between household consumption needs and labor self-exploitation. It argues that the peasant family economy does not operate according to a purely capitalistic business logic, and that Dongshi's grassroots agricultural technology innovation will move in the direction of labor intensifying diversified crops rather than labor saving single crops. This direction of development is a response to Taiwan's agricultural crisis, the urban-rural relationship, and the market structure. The birth of annual grafting pears as a product of the collective creation of the peasants in Dongshi reflects a situation common in Taiwan's rural areas and helps us to rethink the "hidden agricultural revolution" and urban-rural relationships in East Asian industrialized societies.

### **Keywords**

hidden agricultural revolution, peasant household economy, agricultural technology innovation, labor self-exploitation, urban-rural relationship

### **摘要**

本文试图以东势嫁接梨经济的发展历程为例，探讨当代台湾农民家庭经济与农业技术创新之间的关系。嫁接梨是东势农民首创的特殊水果栽培模式，希望克服气候的限制，在亚热带地区种植市场价格更高的温带梨，代价是必需付出数倍于以往的农业劳动投入。虽然政府农政部门普遍认为嫁接梨不符合现代农业发展潮流，农民却不排斥这样劳力密集的水果栽培模式，如今嫁接梨已成为台湾梨产业的主力。结合参与观察、口述历史以及民族志书

写，本文深入分析了家庭消费需求和劳动自我开发之间的紧张关系，希望指出农民家计经济不同于纯粹资本主义企业的经营逻辑，如何导引东势草根农业技术创新走向“厚工—多样”而非“省工—单一”的方向，而这又要放在台湾农业危机、城乡关系与市场结构的宏观脉络下，才能获得比较恰当的理解。本文希望指出：寄接梨作为东势农民集体创造的产物，一定程度上反映了台湾农村的共同处境，有助于我们重新思考隐性农业革命以及东亚工业化社会下的城乡关系。

### 关键词

隐性农业革命、农民家计经济、农业技术创新、劳动自我开发、城乡关系

**Acknowledgments**

This article has benefited from the knowledge I have gained from many outstanding agricultural experts and literary and history researchers in Dongshi as well as from my respondents. I sincerely thank in particular Liu Longlin, Shi Chaoxiang, and Ye Taizhu. Errors and omissions in the article are entirely my responsibility.

I first met the Zhang family when I started my field research in Dongshi 东势, Taichung, in the summer of 2014. Mrs. Zhang came from Hunan, and had lived in Taiwan for more than twenty years. As she tells it, when she first arrived she had no idea that she would live a good part of her life in an orchard on the island of Taiwan. When I met the Zhangs, it was almost harvest season. Looking around, you could see tens of thousands of bulging kraft paper bags covering annual grafting pears hanging on the branches, swaying in the breeze. The way the peasants of Dongshi cultivate annual grafting pears is something they invented themselves. Growing high-chilling pears in a subtropical area requires a great deal of labor. “I was shocked when I first came here! In my hometown, we grow pears also, but not in this complicated way!” said Mrs. Zhang, still with a look of wonder as she spoke.

Mr. Zhang used to work in Shenzhen. About twenty years ago, he return to Dongshi, with his wife, to take over the family orchard and take care of his two daughters and his parents. When he arrived, a crop replacement was in full swing in Dongshi. The peasants were cutting down citrus trees to cultivate a more remunerative crop, annual grafting pears. “Grafting annually definitely is the thing,” explained Mr. Zhang, with a smile. “The insane guy Zhang Rongsheng is to blame,” he declared.

This article explores why this cultivation of annual grafting pears, which violates the rule that only species suitable to the local environment should be raised and which demands intensive labor, took Dongshi by storm. Since Dongshi’s peasants, including Zhang Rongsheng, invented the technology that made the cultivation of the annual grafting pear successful in the late 1970s, many other peasants have followed the same path, casting aside what they used to grow. This innovative farming method rather quickly spread to Heping 和平, Zhuolan 卓兰, Sanwan 三湾, and Shigang 石岡, forming an annual grafting pear economic circle centered on Dongshi. This

has led to a re-intensification of labor in this area.

Annual grafting pears are a high-grade fruit in which Dongshi's farmers take pride, but in fact they are not as profitable as some people imagine. If we look into the cost structure, and compare it with that of other common crops, it becomes obvious that cultivating annual grafting pears is profitable only when one ignores the cost of the family's labor (as discussed below). It seems that peasants who adopted this new crop and its innovative method of cultivation were willing to trade intensive self-exploitation for more income, which, as the peasants term it, amounts to "working hard to save money" 赚自己的工.

Why did Dongshi's peasants engage in this grassroots innovation involving labor-intensive farming within the unstable process of industrialization in Taiwan? One cannot answer this question without acknowledging that switching to different crops was a survival strategy based on the social context of the peasant household economy and the history of Taiwan's agricultural crisis, both of which triggered changes in Dongshi's fruit economy. Only when one understands that the Taiwanese peasant economy revolves around a household economic entity with the ability to flexibly apply labor can one comprehend why Dongshi's fruit economy headed in the direction of labor intensifying diversified crops farming instead of labor saving, single crop farming, which might at first glance appear to be the better urban-rural relationship in the context of rapid industrialization.

Although the Dongshi annual grafting pear economy is a relative special case, it shows that we must reformulate of our notions of the circumstances of Taiwan's peasantry in recent decades. In grappling with the drastic historical wave of differentiation in Taiwan's agriculture, a solid case study is particularly valuable, not only because it brings us close to local issues involved in real rural communities, but also because it can reduce the twin problems of giving

priority to theory and reductionism. Although the history of Taiwan's diversified fruit economy does not fit well with mainstream of agricultural development theory, we should not see this experience as an anomaly or a residual phenomenon. On the contrary, facing up to this history will help us understand the urban-rural relationships of industrialized society in East Asia without resorting to the Western-centric stereotypes.

### **Family Farm Technology and Labor**

#### ***Commercial Farmers vs. Masters in the Field***

Most studies related to Taiwan's rural economy and fruit industry agree that the evolution and spread of cultivation techniques have been of great importance. Early studies focused on specialized export-oriented crops such as bananas, pineapples, and so on, emphasizing the role of the state and the Department of Agricultural Policy Extension (Myers, 1979; Shen, 1976; Huang Junjie, 1984; Zhang, 1974). More recently, researchers have started to focus on the rapid expansion of a diversified fruit economy since the 1970s, but there is no agreement on the role that creative peasants have played.

Some researchers have claimed that peasants who choose to cultivate high-yield crops are different from traditional peasants. They are "commercial farmers" and can deal with fierce market competition (Liao, Huang, and Xiao, 1986; Liao and Huang, 1992; Chen, 1995; Sumiya, Liu, and Tu, 1995; Huang Shuren, 2002). For example, Su-jen Huang has argued that "the sense of life of commercial farmers and traditional farmers is completely different. The former have rid themselves of the attachment to traditional small-scale livelihood agriculture and are totally profit-oriented" (2002: 279). The vigorous development of high-yield and intensive agriculture is understood as the natural result of the supply and demand relationship between urban and rural

modernization: “Economic development has brought about an increase in purchasing power, which has led to the development of the cultivation of aquatic products, livestock breeding, and high-priced fruits and vegetables. . . . This has enabled businesses to engage in capital-intensive, technology-intensive and highly profitable operations on limited land” (2002: 279). Although there has been no in-depth study of agricultural technology itself, advanced agricultural technology is regarded as an important sign of a new type of farmer, attentive to profit.

Another perspective argues that there is no difference between peasants who cultivate cash crops and those who raise traditional crops: they are both “masters in the field” who have a rich history of grassroots agricultural technology innovation (Chen, 2002; Xie, 2002; Wang, 2010; Yang, 2014). Hung-Jen Yang has claimed that the “tacit knowledge” of grassroots agricultural technology is different from the “expert knowledge” that meets scientific standards. But it still has a very positive practical significance: “In fact, since the very emergence of industry, Taiwan’s society has bred many highly skilled master-level peasants” (2014: 92). What cannot be ignored is how local communities and the structures of living churn out the capacity for lively grassroots agricultural technology innovation: “Peasants have learned to be innovative through years of agricultural practice and immersion in rural culture, not in science labs” (2014: 90).

The theoretical constructs of “commercial farmers” or “masters in the field” both emphasize the close relationship between the development of Taiwan’s fruit industry and its cultivation technology. Su-jen Huang’s focus on the relationship between farmers and market has led to farmers being described as “rational entrepreneurs.” However, without firsthand fieldwork, it is difficult to grasp the nature of Taiwan’s agriculture at the grassroots level. Hung-Jen Yang has focused on the relationship between technology and society, showing the community



foundation of grassroots agricultural technology innovations, but has not analyze the economic significance behind these technological innovations, nor has he provide a thorough historical explanation (Yang, 2014). More importantly, researchers have failed to recognize the nature of peasant household economics. They view peasants as simply isolated production units, and they also neglect the relationship between agricultural technology and household labor input.

Therefore, they cannot explain why the peasants of Dongshi created grassroots agricultural innovations and why this has led to the re-intensification of agricultural labor throughout the region.

### ***Flexible Labor Allocation in the Peasant Household Economy***

The unexpected flexibility of the family farm has been widely recognized since the rediscovery of Chayanov in Western academia in the 1960s (Qin, 1996). Chayanov was the best-known representative of the early twentieth-century Russian agrarian populism school. Based on rich empirical evidence obtained in the field, his research argued that the family farm, as a domestic economic organization with a flexible allocation of labor, must consider balancing production and consumption, and hence follows economic principles different from a purely capitalist enterprise. The “substantivism” Chayanov advocated as well as Marxism and formal economics stand as the three grand models of contemporary peasant studies (Huang Zongzhi, 1994b). This article argues that although there is a huge difference between Russia’s rural areas and Taiwan’s, Chayanov’s analysis of the peasant household economy and the elasticity of labor allocation nonetheless helps clarify the economic pressures behind the Dongshi peasants’ grassroots technological innovations.

Chayanov’s long-term study of Russia’s rural economy convinced him that the theoretical

model of individual economics was unable in many ways to explain the economic behavior of peasants. In the end, he concluded that individual economics could explain only the purely profit-driven activities of capitalist enterprises, and thus it was necessary to construct a theoretical model that could account for the economic activities of family farms. The key was that the family farm is not only a unit of labor but also a unit of consumption. Peasants must balance these two functions. Therefore, according to the principle of marginal utility, Chayanov proposed his famous principle of consumption-labor balance: family farms always measure the tension between marginal labor input, the marginal drudgery of labor, and the marginal consumption needs of the family in planning their labor allocation strategy.

From this perspective, peasants are not isolated producers as classical economics would see them, but are members of the “family farm,” a special economic organization. As consumers, peasants seek to maximize their economic output; as producers, they also seek to reduce labor as much as possible. Chayanov emphasized that “the extent of the self-exploitation of peasant labor is determined by the relationship between the level of satisfaction of demand and the degree of the drudgery of labor” (1996: 53).<sup>2</sup> It is on this basis that we can understand why the economic behavior of family farms often does not fit what classical economics would predict. For example, Chayanov found that when the size of the farm and the amount of household agricultural labor force are set, the real factor affecting yield often is the pressure of subsistence rather than the marginal utility of labor: peasants facing heavier economic pressure believe it is necessary to

---

<sup>2</sup> Chayanov did not discuss self-exploitation in terms of Marxist surplus value, but rather in terms of the relationship between household consumption demand and the marginal utility of the “drudgery of labor.” In addition, Chayanov did not explicitly pass judgment on whether self-exploitation is morally positive or negative.

expand output from the land as much as possible, even if the marginal utility of labor is diminishing. Peasants facing less economic pressure are more willing to reduce the hardship of labor and lack sufficient motivation to continue increasing labor input and land output.<sup>3</sup> It must be noted that in terms of the principle of marginal utility, household consumption demand is determined by the family's subjective judgment of what it needs to survive, but the family may also pursue a higher standard of living. The key is still how to strike a balance between household consumption demand and the drudgery of labor.

Only by grasping the relationship between the peasant household as an economic organization and the family's allocation of labor can we understand the extraordinary resilience of family farms: under extremely heavy economic pressures, peasants are willing to continuously increase their labor input, that is, increase their "self-exploitation," up to the point that they feel they cannot tolerate any further increase. Chayanov pointed out that "the basic economic equilibrium conditions within family farms make it possible to accept very low unit remuneration. This allows such farms to survive in conditions so harsh that capitalist farms would undoubtedly be devastated" (1996: 61). In other words, "self-exploitation" as a survival strategy enables family farms to be more flexible than capitalist farms, to ignore employment costs and capital profit rates, and even to continue to expand output as marginal labor compensation falls below the market level. In terms of production costs and yield (production per unit area), capitalist farms are not necessarily more economically efficient than family farms.

---

<sup>3</sup> "When other conditions are the same, peasant laborers are driven by their family needs and work harder, and with the increasing demand pressure to develop greater production capacity. The extent of self-exploitation depends on how much pressure the laborer bears from the family's consumer demand" (Chayanov, 1996: 49).

Chayanov's theoretical contribution lies in pointing out that the family farm's household plan and its intensity of the input of labor are closely related to each other and cannot be analyzed as if they were separate. The concept of "self-exploitation" makes it even clearer that the labor input of family farms has a certain degree of flexibility, and may change along with the relationship between "household consumption demand" and "the drudgery of labor." However, Chayanov's theory of the peasant household economic theory in fact is basically a static model, and does not assume that with additional input of labor, family farms can relieve the economic pressure on themselves through agricultural transformation or technological innovation. More importantly, we also need to further explore the collective destiny of family farms under the rapid urban-rural transition in the process of industrialization, combining peasant household economic theory with broader historical explanations.

### ***A Hidden Agricultural Revolution and Diversified Farming***

How family farms choose to balance financial pressure is shaped by the given social conditions. However, family farms are by no means closed, passive, and stagnant economic organizations. Historical conjunctions may create new possibilities for family farms. Philip Huang has expanded Chayanov's peasant household theory into a broader historical interpretation, which has enriched our understanding of the small peasant economy. In his well-known "theory of involution," Huang (1994a, 1994b, 1994c) simultaneously challenges the theories of classical economics and Marxism. Wielding the concept of involution, Huang has analyzed the household-level economic logic of Chinese peasants' switch to cash crops since the Ming and Qing dynasties. He has also, on the basis of the economic logic of the peasant household, proposed the notion of a "hidden agricultural revolution." Huang has revealed the weaknesses of the

theoretical presuppositions of neoliberalism economics, and also repositioned the historical significance of the rapid growth of high-value agriculture products (such as vegetables, fruit, livestock) after the reform and opening-up policy in China (Huang, 2010, 2014).

Analyzing the labor input and production strategies in the peasant household economy can help us understand the specific historical situation faced by peasants, and in turn link this to the broader issues of social and economic history. Philip Huang (1994a, 1994b, 1994c) found that although the commercialization of China's rural economy increased beginning in the Ming and Qing dynasties, this was not the result of agricultural capitalization but of "involutionary commercialization." In fact, historically speaking Chinese peasants were under extremely heavy population pressure, and for some the solution was to turn to labor-intensive cash crops and family handicrafts to maintain family income at the cost of decreased marginal labor compensation. Huang has further shown that the highly intensive cultivation of the small family farm, because of its economies and efficiency, precluded the development of capitalist farms in China. "Involution" illustrates the predicament of China's rural economy. At the same time, it clarifies that these dilemmas do not originate from defects of the family farm itself. In fact, the elastic family farming production model made it possible to support China's huge population, which is exactly what capitalist farms could not do under the same conditions.

When external social conditions change, family farms may face a variety of new challenges and new opportunities as well. Philip Huang (2010, 2014) found that the rapid growth of China's agricultural output value since the reform and opening up has been based not on a change of the farming model, such as occurred in the agricultural revolution in England, nor on the input of modern production factors, such as in the green revolution, but on the transformation of urban-rural relations. The key lies in the convergence of historical trends, such as the

slowdown in the population growth rate, the migration of peasants to urban areas, and the transformation of the national diet. This has broken the long-term structure of the involutory agriculture of the past and stimulated an unprecedentedly large and diversified food consumption market. This in turn has sparked the rapid expansion of high-output-value agricultural products, such as fruits and vegetables, livestock and poultry, and an increase in the average income of peasants. This rural economic revolution has relied mainly on the expansion of high-value cash crops instead staple grains, “labor-and-capital dual-intensive production,” an increase in total output value rather than total output, and vertically integrated markets. Driven by changing conditions, coupled with the general expectation that Chinese society would (or should) follow the development model of the agricultural revolution in the West, the historical significance of this agricultural revolution has tended to be completely ignored: hence, Huang describes what has been happening in China as a “hidden” agricultural revolution.

The concept of a hidden agricultural revolution reminds us that under certain urban-rural relations and market structures, small family farms exhibit many productive endowments different from those typical of capitalist farms, which in turn can raise household incomes. Philip Huang emphasized that peasant studies have long demonstrated that family farms can compete in the market. If the market can stimulate Chinese peasants to switch to high-value agriculture, this can be conducive to social stability.<sup>4</sup> As Chayanov (1996) demonstrated, the real dilemma of

---

<sup>4</sup> Huang has pointed out that “peasants should be recognized as the subject of initiative and innovation. As long circumstances are suitable, peasants will promote economic development, even under difficult and unfair conditions. But thus far, China’s government has always regarded peasants as either a passive object of control and capture, or a passive object of assistance and support rather than a subject with independent self-esteem” (2014: 9)

small family farming is how to face the market (not production itself), and that agricultural cooperation helps family farms overcome problems of transportation, price fluctuations, and weak bargaining power (Huang Zongzhi, 2014). In contrast, Taiwan's agricultural development experience has shown the value of the "East Asian model" of agricultural cooperation (Huang, 2010, 2014). The green revolution was launched in Taiwan as early as the Japanese colonial period, and in the postwar period the development of cooperative agriculture, with support from the United States, resulted in rapid growth similar to that experienced by Japan and South Korea.

Even if they are thoroughly involved in a commodity economy, family farms, as we have pointed out, still exhibit many endowments different from those of capitalist farms. Philip Huang has noted that the diversified productive potential of the peasant family economy is an issue that still needs to be explored. However, Huang did not analyze the relationship between the small family farm economy and grassroots agricultural innovation, nor did he explain the mechanism by which small family farms returned to labor-intensive agriculture under the trend of what can be called de-involution. The historical experience of the annual grafting pear economy in Dongshi presents an interesting paradox. The East Asian model seems incapable of answering a fundamental question: Why, in the 1970s, did Dongshi's peasants turn to a diversified fruit economy with the potential for grassroots technological innovations? If we do not regard the "hidden agricultural revolution" as a special stage in China's agricultural development, but rather as a generator of economic growth brought about by the diversification of family farm production under a particular urban-rural relationship, we must revisit the historical significance of the rapid expansion of the production of diverse fruits in recent decades in Taiwan.

## **Research Methods**

This article explores how and why the technological innovation in the Dongshi pear industry led to the re-intensification of labor. The extended case method I use here combines participant observation and theoretical reflection. It delves into the general contours of structures without stripping out specificity of particular cases. It avoids severing empirical facts with a simplified theoretical framework and engages in theoretical reflection through exploring particular, concrete cases (Burawoy, 1998). From this perspective, Chayanov's peasant economy theory and Huang's hidden agricultural revolution provide good entry points for our oral history and ethnography of the pear economy in Dongshi.

To begin with, having a close understanding of grassroots practice in agriculture is crucial. From May 2014 to June 2015, I traveled to Dongshi approximately every three to seven weeks to conduct field research. Each visit was for a minimum of one or two days to a maximum of more than one week. In that time, I used snowballing and cold-visit methods and visited thirty-eight peasants or relevant people until I reached data saturation and tracked several key reporters (including the Mr. Zhang mentioned earlier). I observed the operation of the Dongshi fruit economy throughout the year. Compared with standard in-depth interviews, open-ended participation observation is more conducive to penetrating into the life world of peasants and establishing problem awareness in the context of local issues.<sup>5</sup>

The narrative in this article about Dongshi's annual grafting pear industry is nothing new. (Lung-lin Liu's monograph remains the outstanding work on the subject—see Liu, 2017.) It combines the peasants' oral history materials with my observations, and interprets the social significance of annual grafting pear cultivation techniques in the context of the peasant household economy. It is interspersed with details about the lives of my informants and details

---

<sup>5</sup> For further methodological reflections on sociological field surveys, see Ye Shouli, 2017.



about the technology of Dongshi's annual grafting pear industry. Due to space limitations, in most cases my ethnographic account has had to omit a discussion of the differences between individual farms. Instead, it presents the general characteristics of the annual grafting pear economy. The discussion in this article on the economic developments surrounding the annual grafting pear is in some sense a distillation of the collective wisdom of the people of Dongshi.

Since I have had no opportunity to carry out a large-scale basic survey of Dongshi, the article relies on statistical data released by the Council of Agriculture, Executive Yuan. Although there are some problems with the official statistics, most of these problems are not particular to Dongshi, and if the statistics are used to grasp certain uncontroversial and obvious trends, they are valuable. I must point out that I have no intention of replicating Chayanov's theory of individual economics. The statistical data in this article are useful for the descriptions they provide.

As mentioned earlier, the peasants of Dongshi have demonstrated a remarkable capacity for grassroots agricultural technology innovation. However, in terms of methodology, this article does not regard technological innovation as the sole measure of development. Instead, it examines the relationship between technological innovation and the allocation of household labor, and understands Dongshi's peasant household economy the context of rapid industrialization and the transformation of urban-rural relations in Taiwan. From this perspective, agriculture in Dongshi is neither stagnant nor has it evolved into a mechanized agricultural model of labor-saving mass production as in the rice industry. Many innovations in fruit cultivation technology have instead led to the development of labor intensifying diversified crops. The move in the direction of diversity reinforces the existing pattern of labor-intensive family farming and promotes the diversification of crop varieties and the improvement of their quality.

Only by considering the social context of historical change, the peasant family economy, and family labor allocation can one fully understand how these technological innovations could originate from the grassroots.

The complexity and diversity of contemporary rural Taiwan (Ke and Weng, 1993) have constituted a huge challenge for researchers. Although this article assays a new understanding of the collective destiny of Taiwanese peasants, it recognizes the limits of extended case studies and does not attempt to reach any conclusions beyond what is evident in the Dongshi fruit economy. This case study of the annual grafting pear economy nonetheless may offer insight into the situation facing Taiwan's grassroots agricultural practices in general.

## **The Formation of the Annual Grafting Pear Economy**

### ***From Snowflake Pears to Annual Grafting Pears***

Zhang Rongsheng is legendary in Dongshi as the “father of annual grafting pears.” In publications of Taiwan's agricultural agencies, Zhang has also been repeatedly identified as the founder of the annual grafting pear economy (Taichung District Agricultural Research and Extension Station, 2005). However, my fieldwork in Dongshi discovered a more complex picture: it was not Zhang alone who created the annual grafting pear industry; rather, many peasants were instrumental in its making.<sup>6</sup> In other words, the Dongshi method of cultivating annual grafting pears was not a sudden, much less accidental, invention—instead it was the brainchild of many peasants who spent several decades nurturing this product. However, purely for the sake of descriptive convenience, the following discussion treats Zhang Rongsheng as the protagonist in this story.

---

<sup>6</sup> I thank Lung-lin Liu for reminding me of this point.

Zhang Rongsheng was originally an elementary school teacher. Because his father became ill, in 1964 Zhang decided to retire from teaching and take over his father's subtropical pear orchard. Compared to tropical fruits such as bananas and pineapples, which had been extensively planted during the Japanese colonial period, Taiwan's commercial cultivation of pear trees did not begin to expand significantly until the 1960s (Kang, 1992: 193–98). One possible reason for this is that Taiwan's commercial fruit production was long dominated by the Japanese export market, but since Japan itself is a major producer of temperate fruit such as pears, the market for such fruit imported from Taiwan was not large. The peasants of Dongshi came to think that subtropical pears and the other non-export crops could find a market since Taiwan's industrialization and commercialization had raised urban incomes and this in turn had created a demand for high-priced foods.

The peasants of Dongshi recalled that in the 1960s the income of rice farmers was far less than that of blue-collar workers in the cities. But cultivating fruit opened the door to incomes that could compare with those of ordinary white-collar workers. This was also an important factor in Zhang's decision to retire from teaching: running his family's family orchard would not entail a sharp drop in income.

However, the fruit market has experienced many vicissitudes, and in response, peasants' income has fluctuated. In the mid and late 1960s, temperate pears began to be raised in the mountains, and gradually shrank the market for the subtropical pears that Zhang relied on. At the same time, bananas, which had once been a very profitable export, lost their overseas market, and rice-growing peasants also found it difficult to sustain their success even though the Farmers Association provided guidance. The agricultural crisis that spread throughout rural Taiwan in the 1970s (Liao and Huang, 1992; Liao, Huang, and Xiao, 1986) profoundly affected Dongshi's

peasants.

Switching to high-price cash crops was one of the ways Dongshi's peasants coped with the agricultural crisis. They tried planting various types of fruits, and as a result, they unwittingly promoted the expansion of a diversified fruit economy.<sup>7</sup> In less than ten years, orchards not only replaced paddies on Dongshi's valley plains, but also extended rapidly into the mountains. Peasants recalled that in the 1970s when they were busy learning how to grow all kinds of fruits, many tragicomedic dramas surrounding this agricultural transformation unfolded. Some people got rich, others lost everything. Peasants with high ambitions looked for the newest agricultural models. Compared with conservative peasants, they were very closely watching developments. Successful experiences could easily be imitated by neighbors in the village. The spread of new crops was fast. Under the circumstances, Zhang Rongsheng constantly looked for a new model of fruit cultivation that could quickly improve peasants' fortunes.

It must be noted that the switch to different crops is not an isolated individual economic activity but a step that affects the livelihood of the entire family. For example, Zhang and his friends planned to cultivate grapes in the south of Taiwan. At first, he thought that Dongshi's peasants had the best cultivation techniques, and if those techniques were practiced in the south, the prospects for success were very good. At that time, many peasants were researching "production season adjustment" technology for grapes and hoped to use pruning and germination

---

<sup>7</sup> The process of replacing rice with fruit in Dongshi did not signal economic development in the classical social science sense—that is, substituting a commodity crop for a staple food crop—but instead was a survival response of Dongshi's peasants facing Taiwan's rural crisis. This response was a product of the convergence of many historical, social, and cultural conditions. See Yeh, 2016.

techniques to make possible three grapes harvests a year. However, Zhang's family did not want him to leave his hometown and his plan remained unfulfilled.

Although Zhang couldn't make his plan come true, he start thinking that "production season regulation" might work on subtropical pears. Compared with the rice market, controlled by the government, the fruit market was vulnerable to price fluctuations caused by changes in supply and demand, but this also provided room for peasants to revise their operations. Many peasants experimented and found that as long as a defoliant was used on pear trees in the summer, subtropical pears could be brought to fruition as early as within five months, and thus the pattern of pear trees blossoming in the spring and bearing fruit in the autumn was inverted, so that the trees blossomed in the autumn and bore fruit in the spring. Hence, the dilemma of temperate pears pouring into the market at the same time could be avoided. Dongshi's peasants referred to the inverted pear as the "snowflake pear" and Zhang Rongsheng wrote a paper on snowflake pear cultivation methods that played an important role in promoting this fruit. The success of snowflake pears meant that peasants could, through painstaking cultivation techniques and more labor input, produce pears that had a good market and thus improve the economic status of the entire family.

In the early 1970s Zhang heard that someone was trying to graft temperate pears onto subtropical pear trees, exciting news because at the time the market price for temperate pears was ten times higher than for subtropical pears.<sup>8</sup> Zhang called together a group of peasants to rigorously test whether grafted pears could be successfully raised in Dongshi. The biggest obstacle at that time was that temperate pears would not bear fruit in subtropical areas like

---

<sup>8</sup> "The price of two pieces of fruit was enough to cover a student's registration fees for an entire semester" (Xie, Lin, and Zeng, 2000: 54).

Dongshi. Therefore, there was no point in simply grafting temperate pear slips onto subtropical trees. But there is a solution, as they discovered, and that is grafting high-chilling pear flower buds to subtropical trees. They dubbed this the “borrowing a child” method. The problem is that the buds have to be grafted one by one each year. Although this is a complicated and extremely labor intensive method of cultivation, it promised to break the market monopoly of mountain-grown temperate pears and completely change the fortunes of Dongshi’s peasants.

Zhang Rongsheng and the other peasants continued to experiment year after year, without any precedent for reference. They could hope for success only by understanding the dormancy characteristics of temperate pears, and knowing when temperate pear buds could be grafted. Second, the technique of grafting is also very important. Zhang and others went around searching for people experienced in grafting (most of whom had grafted citrus trees in the past), sent large numbers of high-chilling buds to Dongshi, and very carefully recording the test results.

However, Zhang and the others faced the problem that the institutional environment did not encourage their attempts. Despite all their hard work, the government simply did not support their effort. This was during the martial law era, and the government was wary of spontaneous peasant organizations. When Zhang and his friends used the term “flower material” to import Japanese flower buds for testing, customs destroyed them. Government agricultural experts even denied the feasibility of this experiment and pointed out that the cumbersome process of annual grafting would inevitably detract from the pears’ commercial value. In the 1970s, Taiwan’s agricultural agencies focused on such policies as “accelerating rural construction” and a “second land reform,” hoping to transform agriculture in Taiwan along the lines of a large-scale mechanized agribusiness model (Wang et al., 1970; Zhang, 1980; Liao, Huang, and Xiao, 1986). As a result, they were not interested in labor-intensive agriculture. In addition, the initial output

and quality of the test pears were unstable.

In 1976 the Farmers Association approved the establishment of a fruit production and marketing research class, an extremely important step toward success. A coordinator in the Farmers Association recognized the potential of annual grafting pears and supported the establishment of the first peasant research class in Taiwan, giving Zhang Rongsheng's research team legal status. With the collective efforts of the first twelve members, Zhang and others gradually mastered the core technology of grafting temperate pears and achieved large-scale commercial production around 1980. More than that, they shared their experience with other peasants and unselfishly promoted appropriate orchard management methods. Zhang Rongsheng passed away in 1993. By that time, a large number of Dongshi's peasants had switched to annual grafting pears. His son left this record:

To be honest, my father had not earned much money in the past few years. In the early days, it was a constant experiment. Later, because he wasn't well, he didn't come to orchard as much as usual. . . . In the memorial ceremony, an old peasant brought a string of fresh pears (he took very good care of them and they matured earlier than others) and came to pay his respects to my father's spirit, pay homage to him, and thank my father for improving his life. Everyone was impressed by the old peasant and their eyes were full of tears. (Liu, 2017: 104)

### ***The Invention of Labor-Saving Equipment***

For Dongshi's peasants, the switch to annual grafting pears meant that they could substantially increase their household income in a short time. The problem is that cultivating annual grafting pears is labor intensive and requires advantage techniques during a few specific short busy

seasons. This high threshold of labor input led many peasants to give up any thought of switching.

In order to improve their labor efficiency, many peasants have invested in the development of labor-saving equipment. First of all, the appearance of a “safety grafting knife” that mimics a planer allows peasants to no longer need to use a folding knife, which greatly increases the efficiency and safety of grafting. Second, “fixing tape” in place of wire and plastic sheeting has become a fixture in the orchards. This tape is not only is sticky, elastic, and strong, but it is also easy to tear. Third, in the past peasants had applied paraffin wax to the cuts to avoid sun exposure and water loss. Later, they developed a “stick wax” that did not require continuous heating, which greatly reduced the time required for this operation. Fourth, the peasants later designed a special “plastic envelope” that was just the right size to fit on a newly placed pear branch, avoiding wounds from being exposed to the wind and rain, and eliminating the need to wrap the grafts with old newspapers. Fifth, in order to protect the annual grafting pear fruit from birds, insects, and sunburn, peasants affix kraft paper bags to each pear. The bag has a multi-layer structure (a waterproof outer layer, and an inner to provide shade) with drainage holes and vents. Sixth, the bags are attached with a piece of special iron wire, which is very flexible and easy to remove. It is especially suitable considering the large number fruit to be bagged. Seventh, because ordinary ladders are difficult to use in the orchards, peasants invented a triangular ladder, which facilitates the grafting work.

In Taiwan, there are very few other fruit industries that use so many exclusive tools, but these agricultural tools and materials mentioned above are now commonly seen in Dongshi and are produced and supplied by many manufacturers. It must be emphasized that although labor-saving equipment may simplify the work involved in grafting, the actual effect has been to



significantly reduce the barriers to the cultivation of pears and to attract more peasants to join in. As a result, the agricultural labor input in the entire region has “re-intensified.” This has led to the prospect of a substantial increase in family income and has convinced many young people to return home.

Today, the cultivation techniques for annual grafting pears are mature. Although each peasant may have some unique ways of handling specific cultivation details, the basic cultivation mode for annual grafting pears has been established. First, good subtropical pear trees must be used as the rootstock for building scaffolding “pressing branches” (which enhances wind resistance and improves the efficiency of grafting) and branches must be carefully trimmed (the angle and length are very important) so that nutrients will be concentrated in the strongest branches and space will be effectively allocated. Temperate pear blossoms (from Lishan, Japan, or North China) need to be refrigerated for about thirty days (to meet the low-temperature requirement). Before the grafting, all the spikelets must be carefully cut and the bud top cuts must be sealed with a specific wax (to prevent the loss of water). Then the safety knife is used to graft the cut flower buds to the pear tree, the grafts are wound with tape, and finally a plastic cover is added. Once the pear trees bloom, the plastic covers have to be removed one by one and the flowers must be pollinated by hand (which increases the chance that they will produce). This is followed by sequential flowering, fruit thinning (preventing the dispersal of nutrients), and tail cutting (which promotes fruit formation). Once the fruit appears, a kraft paper bags is put around each pear. The next step is to carefully control the application of fertilizer (which will affect the flavor) and pesticides. Weeding and irrigation are also required. The harvest is the last, laborious task. The harvesting, sorting, grading, and packaging have to be completed in a short time.

About a hundred and fifty to two hundred flower buds can be grafted to each subtropical

pear tree. In a one-hectare orchard, about fifty thousand flower buds will need to be grafted. Each bud can grow about three to five temperate pears. This means that in every production cycle, peasants must carry out each step close to a million times. In fact, this completely exceeds the labor that one household can provide. In the short busy seasons, peasants have to hire a large number of workers to help. The labor costs (that is, the cost of employing temporary workers) constitute the biggest item in the cost of annual grafting pear production (Taichung District Agricultural Research and Extension Station, 2005). In order to reduce the cost of hiring labor, Dongshi gradually formed a well-known labor exchange system: peasants agreed to assist each other and to do so without pay. As a result, this has caused an increase in the total labor input of the peasants, because now they not only have to bear the burden of working their own orchard, but also have to the work at other orchards to keep this cooperative network viable.

The birth of the annual grafting pears has fundamentally changed Taiwan's pear industry. Since the 1980s, the range of cultivating pears has expanded rapidly. Peasants recalled that during that time, the purchase price of subtropical pears was about NT\$10 to NT\$30 per kilogram, but using the annual grafting cultivation method, it was possible to cultivate temperate pear with a price of NT\$80 to NT\$120. More importantly, manual grafting helps to control output, and as long as one can graft different types of temperate pears by oneself, there will be new opportunities to create market segments. All this has given peasants more room to operate.

After 1990, subtropical pears almost disappeared from the scene because most of pear growers in Dongshi had turned to cultivating annual grafting pears. Fruit growers who originally planted other crops also joined in, just like Mr. Zhang abandoned citrus and switched to annual grafting pears. The figures for 1997 show that the percentage of planted area devoted to subtropical, annual grafting, and temperate pears in Taiwan changed to 9 percent, 54 percent, and

37 percent respectively. In other words, annual grafting pears had become the main variety raised in Taiwan (Taichung District Agricultural Research and Extension Station, 2005: 14–15). As Figure 1 shows, between 1980 and 2010, the output and production value of all pears in Taiwan increased by 167 percent and 427 percent respectively. That the growth rate of the production value was much faster than the output can be put down to technological innovations and the intensification of labor.

Figure 1 about here

## **The Peasant Household Economy in Dongshi**

### ***Working Hard to Save Money***

Contrary to the government’s expectations, the grassroots technological innovations in Dongshi meant that the peasants welcomed a harsher, more labor-intensive agriculture. Data from the year 2010 show that the number of hours of labor required for every hectare of annual grafting pears is 1,230 percent higher than in (mechanized) rice cultivating (see Table 1). Even though annual grafting pears are extremely labor-intensive, peasants in Dongshi seem to have embraced them. In this regard, what has transpired in Dongshi tends to confirm Chayanov’s peasant household economy theory.

Table 1 about here

To clarify the economic logic of the peasant household economy in Dongshi, terminology used by the government’s agricultural agencies is useful. Dongshi’s peasants focus on “family labor remuneration” 农家赚款 (“surplus or deficit” 损益 [i.e., the break-even point] + “family labor” 自家工 [i.e., imputed wages]) rather than on the “surplus or deficit” (“gross income” 粗收益 – “production costs” 总生产费用). The true advantage of cultivating annual grafting pears lies in its excellent “family labor remuneration,” but this true only when we ignore “family labor”

and the “surplus or deficit.” Table 2 compares the income per hectare of common crops in the Dongshi area between 2000 and 2010. We can see that the “family labor remuneration” of annual grafting pears was indeed far ahead of other crops, but due to the extremely high burden of “family labor” costs, it was offset by the break-even point (or, “surplus or deficit”).

Table 2 about here
--------------------

However, for the Statistics Department of the Council of Agriculture the “surplus or deficit” is a fundamental reference value. If one is talking about a typical agribusiness, then of course the cost of the labor the family provides should be included in the total production cost. Therefore, based on the number of labor hours and market conditions, the “family labor” cost of each crop (that is, the imputed wages of family labor opportunity costs) can be estimated in order to calculate the real surplus or deficit. But in the Dongshi peasants’ logic, such calculations are meaningless. The peasants are concerned about how to maximize the family’s monetary income in order to improve the family’s life, and so in making their production decisions they do not deduct the cost of “family labor” from “family labor remuneration.”

Of course, the peasants fully understand that “family labor” is also a cost. And so they will carefully consider the amount of labor needed when thinking about switching to a different crop. However, for peasants it is more important to measure the relationship between “family consumer demand” and the “drudgery of labor” rather than carefully calculating the break-even point. In general, peasants can meet the demand for all agricultural labor input in an orchard through hired workers, thereby reducing to a minimum the “drudgery of labor.” However, this also means that hiring labor will inevitably increase production costs. In fact, peasants will only hire workers during the busy farming season when households are overburdened.<sup>9</sup> In order to cut

---

<sup>9</sup> Some older peasants hire workers to take care even such simple work as daily weeding.

down on the cost of hired labor, the peasant household will increase its own labor input as much as it can, or, as the Taiwanese put it, “work hard to save money” 賺自己的工. Therefore, in the subjective understanding of Dongshi’s peasants, a higher degree of labor self-exploitation actually means a cost savings, especially when economic pressures are high.

Taking the Zhang family as an example, Table 3 compares the family’s average income from citrus and from pears from 2000 to 2010. (Table 3 is based not on an actual investigation of the Zhangs’ orchard, but rather is abstracted from survey data available from the government.<sup>10</sup>) The figures show that when the Zhangs switched to pears from citrus, their “family labor remuneration” increased by 155.2 percent, but “family labor” also increased, by 214.2 percent: in other words, family income grew 1.55 times while family labor input increased 2.14 times. In short, the Zhangs’ switch to pears from citrus raised “family labor remuneration” at the expense of diminishing marginal labor compensation.

Prod. ed.: Table 3 about here
-------------------------------

However, what was significant for the Zhang family is that the average “family labor remuneration” gap between the two crops was as high as NT\$247,982. For a Taiwanese peasant family, the difference in annual income of NT\$240,000 is very important, even if it entails diminishing marginal labor compensation. In the early 1990s, when Mr. Zhang gave up his job in Shenzhen and returned to Dongshi, what kind of emotions and thoughts led him to decide to

---

However, this does not violate the principle of peasant household economics and has nothing to do with the so-called capitalist farming.

<sup>10</sup> The data from the government are in the form of NT\$ per hectare. Since the Zhangs’ orchard is 1.3 hectares, the figures in Table 3 represent the government’s figures multiplied by 1.3. Data for the year 1980–2000 are incomplete.

cultivate annual grafting pears? After twenty years, when his two daughters had finally grown up, how can one calculate the cost of years of bitterly difficult work and, on the other side of the ledger, the value of the pride he took in his skills? If one does not put the peasant household economy into perspective, one cannot truly understand Taiwan's rural areas.

The reason Dongshi's peasants have embraced the annual grafting pear economy may be precisely because the specific cultivation pattern created by the peasants meets their needs as they see them. For peasant families with higher nonagricultural employment opportunity costs and sufficient family labor, as long as they are willing to bear a higher degree of "drudgery," cultivating annual grafting pears is an opportunity to substantially improve the family's income. Here, we do not have to indulge in a series of value judgments about labor self-exploitation. In fact, peasants will not unreasonably increase the "drudgery of labor." Returning to the perspective of historical change, perhaps the following question deserves more attention: What kind of urban-rural relationships and market structures have increased the pressure on the survival of the peasants in Dongshi and forced them to constantly look for alternative crops even when those crops entail increased agricultural labor inputs?

### ***The Direction of Technological Innovation***

Only in the context of broader social change can we fully appreciate the historical significance of the birth of annual grafting pears. Chayanov's peasant household economy theory as an individual economic model cannot account for the external factors that have promoted the development of Dongshi's annual grafting pear economy. To grasp what has happened in Dongshi, we should regard the crop switching as a type of survival strategy, and from that point we can apply Philip Huang's notion of "hidden agricultural revolution" to understand the

peasants' living conditions under the changes in the macro urban-rural relationship and the formation of market structures.

The relationship between industrialization and socioeconomic change in contemporary rural areas has been a subject debate among many scholars. Both modernization theory, which argues that the smallholder peasant economy in the modern industrial and commercial economy will gradually decline (Zhang, 1974; Yu, 1975; Shen, 1976; Myers, 1979; Li, 1980; Zhang, 1980; Huang Junjie, 1984; Liao and Huang, 1992; Liao, Huang, and Xiao, 1986; Mao, 1994; Huang Shuren, 2002), and dependency theory, which predicts rural depression under the plunder of state and capital (Ke, 1988, 2006; Liu, 1992; Chen, 1995; Sumiya, Liu, and Tu, 1995; Tu, 1999; Yanaihara, 2002; Liu and Ke, 2002; Zhang, 2014), fail to explain why small family farming has stubbornly survived in Taiwan (see Yeh, 2016). It is time, I argue, to put aside the normative issue of whether the small peasant economy should evaporate with the development of capitalism, and instead recognize there is an abundance of peasant survival strategies under the impact of rapid industrialization.

It is clear that under the impact of Taiwan's agricultural crisis of the 1970s (Liao, Huang, and Xiao, 1986; Liao and Huang, 1992), the countryside has not simply suffered a decline but instead has undergone a dramatic differentiation (Ke and Weng, 1993). Another thing that stands out in Taiwan's agrarian structure is that between 1960 and 2010, the ratio of rice, vegetables, and fruit production in Taiwan shifted from 61:26:13 to 18:41:41 and the ratio of output value changed from 85:9:6 to 20:33:47 (Yeh, 2016: 308–9). The rapid growth of the fruit industry is particularly notable.

The shift in output ratios suggests that Taiwan also experienced a broad hidden agricultural revolution as early as the 1970s. From the perspective of the goals of this article—to

summarize the historical experience of Dongshi's annual grafting pear economy and clarify the relationship between fruit cultivation technological innovations, the allocation of labor, and peasant household economy—the birth of the annual grafting pear is not an instance of the natural evolution of capitalism, but the result of the long-term interaction between the peasants in Dongshi and the conjuncture of greater historical change. There have been both active and passive adaptations. However, we should not underestimate the flexibility and resilience of small family farming in the face of changes in urban-rural relations.

In fact, the oral history of Dongshi's peasants shows that they are constantly searching for survival strategies that can improve their families' lives in the face of extremely limited social resources under the impact of the agricultural crisis. Throughout the 1970s, Taiwan's rural areas suffered both internal and external dislocations: not only was the Farmers Association's concentration on grain production unsustainable, but also the export market for cash crops was rapidly shrinking. Short-term rapid industrialization also led to an ever-increasing income gap between urban and rural areas, as well as rapid de-population of the countryside and aging of the agricultural workforce. The way out for Dongshi's peasants, concerned about how best to support their families, was the rapidly growing domestic demand for fruit. This was a conjuncture of historical contingency and structural necessity.

Many Dongshi residents think that the local fruit economy is diversified and they should be grateful for Dongshi's excellent climate and geography. However, if it were not for the convergence of many external factors, Dongshi's agriculture might have continued following the model adopted at the end of the Japanese colonial rule, that is a single-crop export model. Instead, Dongshi moved toward a diversified fruit economy catering to Taiwan's consumer market. The paradox is that this happened during the slump in Taiwan's banana exports in the late 1960s (Wu,



1993), forcing peasants who had relied on the old vertically integrated transportation and supply network to explore other ways of survival. According to the peasants of Dongshi, the Dongshi Farmers Association did not play an important role in the development of the annual grafting pear industry. However, this does not mean that the peasants have denied the importance of agricultural cooperation. On the contrary, they are generally eager for support from agricultural cooperative organizations or other public agencies.

What can't be ignored is that the narrowness of the market for domestic fruit in Taiwan has also been a key factor in promoting the diversification of Dongshi's fruit economy. As the fruit supply becomes more and more saturated, peasants become increasingly aware that real opportunity comes from the creating product differentiation rather than blindly increasing production. If this were not the case, Zhang Rongsheng would not have had to make every effort to develop grapes that would mature out of season, snowflake pears, and annual grafting pears. In the absence of strong support from the government or cooperatives, in order to avoid the market cycle of overproduction followed by plunging prices, the response of the peasants of Dongshi has been to switch to more expensive and rarer fruit as far as possible, to study how to get fruit to bear in the off season, to search for new cultivation methods, to look for new crops with market potential, and to try to raise the quality of their fruit. It was the convergence of many conditions that eventually led to the diversification and refinement of fruit growing in Dongshi. In other words, Dongshi's peasants have tried to resist market volatility with sophisticated and diverse cultivating strategies.

Annual grafting pears are just one eye-catching case: in the face of market adversity, Dongshi's peasants spent nearly a decade collectively creating a new type of high-value crop. In this process, they demonstrated their capability for grassroots technological innovation. However,

many social conditions set limits on technological innovation. For example, it is difficult for Dongshi's peasants to imagine how they can obtain large labor-saving agricultural equipment and engage in large-scale mechanized fruit cultivation: they lack the funds to purchase such equipment, and do not themselves have the engineering know-how to design machinery for mechanized fruit cultivation. Moreover, in a peasant household economy, all agricultural investment means drawing from the household's annual consumption. This requires prudence. For instance, importing temperate pear blossoms from Japan worth hundreds of thousands of NT dollars was considered a bold step. In other words, Dongshi's peasants can rely on only their own hands, labor, experience, and technology, and on their small family farms.

This is why the grassroots agricultural technology innovation in Dongshi eventually led to labor-intensifying diversified crop farming rather than labor-saving single crop farming. In a contrasting case, in his field research on the Changhua Plain, Ying-kuei Huang (1979) found that the local rice industry turned to mechanization because Taiwan's rapid industrialization in the 1970s caused a sharp rise in wages, forcing farmers to seek labor-saving methods. On many occasions I have heard peasants joking: "Today, we need to make only three calls to grow rice: first, call people to do the cultivating, then ask someone to spray pesticides, and finally find others to bring in the harvest. The landowner never needs to go into the fields." Although this is an exaggeration, it reflects the nature of Taiwan's mechanized rice industry today. Indeed, cultivating rice in Taiwan can be done by around a thousand agricultural machinery cultivating teams with millions of capital. They use one or another form of sharecropping or the landowner outsources the farmwork to them. These teams are active all across Taiwan's plains.

Also in the 1970s, the fruit economy of Dongshi took a completely different direction. As a product of the collective creation of the peasants in Dongshi, the route followed by annual

grafting pears was to create a new product segment in the fruit market through cultivation and technological innovation and additional labor input, so as to achieve higher household incomes. The government's agricultural agencies initially questioned the wisdom of this move because it was something that exceeded the imagination of so-called modern agriculture technocrats. The peasants in Dongshi see the pears in a different light: they believe that the birth of the annual grafting pear has improved their lives, expanded job opportunities, and brought economic prosperity to Dongshi, giving young people in the countryside an opportunity to raise a family, and, through the exchange labor system, maintaining good human relations with one's neighbors. The cultivation of the pears is indeed complicated and labor-intensive. But such quality agricultural techniques also reveal the dedication and pride of many peasants, and show that they have the ability to survive on their own.

The re-intensification of labor input and the variety of crops in Dongshi's agriculture reflect the tenacity of family farms and the asymmetry between urban and rural areas. Dongshi's peasants are very sensitive to prices, but they lack the collective bargaining power of agricultural cooperatives. Technological innovation and self-exploitation are the only chips they have to resist market fluctuations. In order to support their families, they must exhaust every opportunity and look everywhere for new crops and technologies. If necessary, they can do more and work harder, even if it increases their income just a little. "It's all money!," a man once said to me. "I'm short of money. I have to be very serious about finding money and I find money in the land." This is the social background to the annual grafting pear, and is widely accepted by Dongshi's peasants.

However, ultimately the bonus from switch to different crops is limited. The farm price of the four varieties of temperate pears (新世纪梨、丰水梨、幸水梨 and 新兴梨) declined by

about half throughout the 2000s (see Figure 2). This means that the income of the peasants was halved and the purchasing power of consumers of temperate pears was doubled. Urban residents are clearly the biggest beneficiaries of this highly skewed agro-supply system.

Figure 2 about here

Let us conclude this section by returning to the Zhangs' orchard. When I first visited the orchard, I was surprised: "The trees are planted so densely; won't they lack nutrients?" Mr. Zhang replied: "That's why we fertilize them." It was close to the harvest season, and I had to bend over when I walked so as not to bump the fruit covered in brown paper bags. To show me what the pears look like, Mr. Zhang carefully opened a bag, and then carefully resealed it. Will the labor required by such dense and laborious cultivation ever be eliminated? At that time, the plight of Dongshi's peasants became clear to me. The real difficulties seemed to be the problems of overproduction, low market prices, and a seasonal shortage of labor. But I rarely heard the peasants complain about the long hours they had to put in. In fact, Mr. Zhang was thinking about switching to another crop. The farm price of sweet persimmons, which were growing next to the orchard, seemed to be good, but the market fluctuated wildly. Zhang thinks that he should wait a while and see what happens. At that time, his two daughters had already reached high school age and one of them insisted on studying at an agricultural school. Mr. and Mrs. Zhang have mixed feeling about this. "But this orchard will have your daughter to take over it!" I said. "I'd rather she do whatever she wants to do in the future," Mr. Zhang said with a smile.

## **Conclusion**

The current Taiwan fruit economy presents a complex picture that deserves continued attention from researchers. An analysis of policies, systems, and market institutions is also very valuable,

but it inevitably misses the real people working on the farm frontlines. This article has explored, from the perspective of the peasant household economy, why the agricultural innovations in Dongshi's fruit economy moved in the direction of labor intensifying diversified crops' rather than the labor saving single crop model similar to the mechanized rice industry. Whether one talks about concepts like commodity-producing peasants or masters in the field, and so on, it remains difficult to summarize the survival strategy of Dongshi's peasants in the process of Taiwan's rapid industrialization.

The birth of the annual grafting pear was a collective creation of the peasants of Dongshi, but it was also a reflection of the collective dilemma of Taiwan's peasants and Taiwan's highly skewed urban-rural relationship. Peasants accept the drudgery of such highly intensive work because they see it as an excellent opportunity to improve their families' situation. In this context, the impetus behind Dongshi's hidden agricultural revolution has been, in the first instance, Taiwan's agricultural crisis under the transformation of urban-rural relations and, at the same time, the flexibility and resilience of family farms in responding to economic pressure.

The complexities of the contemporary rural economy are so numerous that no single theoretical paradigm can account for all of them. Chayanov's peasant household economy theory and Philip Huang's hidden agricultural revolution concept are not intended to argue that family farms are superior or even reasonable, but rather to provide a corrective to mainstream economics. This article's goal has been simply to rethink the tenacity and creativity of grassroots peasants, and reflect on the highly skewed urban-rural relationship in contemporary Taiwan.

## **References**

Burawoy, Michael (1998) "The extended case method." *Sociological Theory* 16, 1: 4–33.

Chayanov, Alexander 恰亚诺夫 (1996) 农民经济组织 (Peasant economic organization). Trans.

by Xiao Zhenghong 萧正洪. 北京: 中央编译局出版.

Chen Xianming [Hsien-ming Chen] 陈宪明 (2002) 由农业资材行的运作看栽培技术的发展与

扩散——以屏东平原莲雾产业为例 (The development and diffusion of farming techniques

via agricultural supply shops: a case study of the wax apple industry on the Pingdong

plain). 国立师范大学地理研究所硕士论文.

Chen Yuxi [Yu-Hsi Chen] 陈玉玺 (1995) 台湾的依附型发展 (Taiwan's dependent

development). 台北: 人间出版社.

Huang Junjie [Huang Chun-chieh] 黄俊杰 (1984) 面对历史的挑战: 沈宗瀚与我国农业现代化

的历程 (Facing the challenge of history: Shen Zonghan and the history of China's

agricultural modernization). 台北: 幼狮出版社.

Huang Shuren [Su-jen Huang] 黄树仁 (2002) 心牢: 农地农用意识形态与台湾城乡发展 (The

caging of the mind: the ideology of the use of farmland and the development of the village

and city in Taiwan). 台北: 巨流出版社.

Huang Yinggui [Ying-kuei Huang] 黄应贵 (1979) “农业机械化: 一个台湾中部农村的人类学

研究” (Agricultural mechanization: an anthropological study in central rural Taiwan). 中央

研究院民族学集刊 46: 31-78.

Huang Zongzhi [Philip C.C. Huang] 黄宗智 (1994a) 中国研究的规范认识危机: 论社会经济史

中的悖论现象 (The paradigmatic crisis in Chinese studies: paradoxes in social and

economic history). Hong Kong: Oxford Univ. Press.

Huang Zongzhi (1994b) 华北的小农经济与社会变迁 (The peasant economy and social change

- in north China). Hong Kong: Oxford Univ. Press.
- Huang Zongzhi (1994c) 长江三角洲小农家庭与乡村发展 (The peasant family and rural development in the Yangzi delta, 1350–1988). Hong Kong: Oxford Univ. Press.
- Huang Zongzhi (2010) 中国的隐性农业革命 (China's hidden agricultural revolution). 北京: 法律出版社.
- Huang Zongzhi (2014) 明清以来的乡村社会经济变迁: 历史、理论与现实 (卷三: 超越左右: 从实践历史探寻中国农村发展出路) (Rural socioeconomic change from the Ming and Qing: history, theory, and the present. Volume 3: Beyond the left and the right: searching for a path of development for rural China from the history of practice). 北京: 法律出版社.
- Kang Youde 康有德 (1992) 水果与果树 (Fruit and fruit trees). 台北: 黎明文化事业出版社.
- Ke Zhiming [Chih-ming Ka] 柯志明 (1988) “原始积累、平等与工业化: 以社会主义中国与资本主义台湾案例之分析” (Primitive accumulation, equality, and industrialization: a case study of socialism and capitalism Taiwan). 台湾社会研究季刊 1: 11–51.
- Ke Zhiming (2006) 米糖相克: 日本殖民统治下台湾的发展与从属 (The contradictory relationship between rice and sugar: Taiwan's development and subordination under Japanese colonialism). 台北: 群学出版社.
- Ke Zhiming and Weng Shijie 翁仕杰 (1993) “台湾农民的分类与分化” (The classification and differentiation of Taiwan's peasants). 中央研究院民族学研究所集刊 72: 107–50.
- Li Denghui [Lee Teng-hui] 李登辉 (1980) 台湾农业发展的经济分析 (An economic analysis of Taiwan's agricultural development). 台北: 联经出版社.
- Liao Zhenghong [Jingo C. Liao] 廖正宏 and Huang Junjie [Huang Chun-chieh] 黄俊杰 (1992)

战后台湾农民价值取向的转变 (Changes in the value orientation of Taiwan's peasants after the war). 台北: 联经出版社.

Liao Zhenghong, Huang Junjie, and Xiao Xinhuang [Hsin-huang Michael Hsiao] 萧新煌 (1986) 光复后台湾农业政策的演变: 历史与社会的分析 (The evolution of Taiwan's postwar agricultural policy: a historical and social analysis). 台北: 中央研究院民族学研究所出版.

Liu Jinqing 刘进庆 (1992) 台湾战后经济分析 (An analysis of Taiwan's postwar economy). 台北: 人间出版社.

Liu Longlin [Lung-lin Liu] 刘龙麟 (2017) “寄接梨补遗” (The story of the annual grafting pear). Unpublished paper.

Liu Zhiwei [Chi-wei Liu] 刘志伟 and Ke Zhiming 柯志明 (2002) 战后粮政体制的建立与土地制度转型过程中的国家、地主与农民 (1945–1953) (The state, landlords, and peasants in Taiwan's postwar agrarian transformation, 1945–1953). 台湾史研究 9, 1: 107–80.

Mao Yugang [Yu-kang Mao] 毛育刚 (1994) 台湾农业发展论文集·续编. 台北: 联经出版社.

Myers, Ramon 马若孟 (1979) 台湾农村社会经济的发展 (Transformation and tradition in Taiwan's peasant economy). Trans. by Chen Qi'nian 陈其南 et al. Hong Kong: Oxford Univ. Press.

Qin Hui 秦晖 (1996) “当代农民研究中的‘恰亚诺夫主义’” (“Chayanovism” in contemporary peasant research). Pp. 2–6 in Alexander Chayanov 恰亚诺夫, 农民经济组织 (Peasant economic organization). 北京: 中央编译出版社.

Shen Zonghan [Tsong-han Shen] 沈宗瀚 (1976) 台湾农业之发展 (Taiwan's economic development). 台北: 台湾商务.



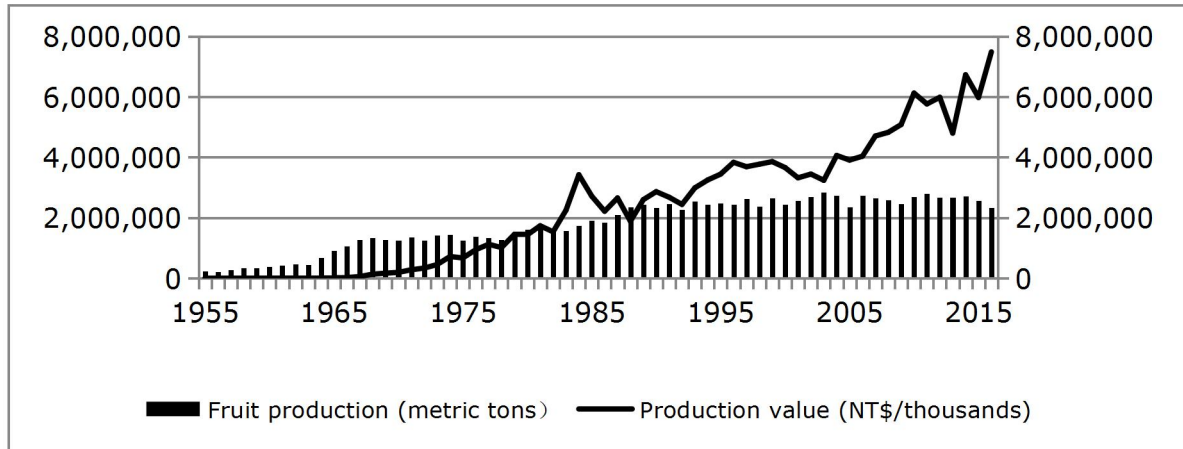
- Sumiya Mikio 隅谷三喜男, Liu Jinqing 刘进庆, and Tu Zhaoyan 涂照彦 (1995) 台湾之经济: 典型 NIES 之成就与问题 (Taiwan's economy: achievements and problems of the NIES model). 台北: 人间出版社.
- Taichung District Agricultural Research and Extension Station 行政院农业委员会台中区农业改良场编 (2005) 梨栽培管理技术研讨会专集 (Pear cultivation management seminar). 台中: 农委会台中农改场.
- Tu Zhaoyan 涂照彦 (1999) 日本帝国主义下的台湾 (Taiwan under Japanese imperialism). 台北: 人间出版社.
- Wang Guanzhou 汪冠州 (2010) 技术的共变转换: 牛奶凤梨乡的技术与社会 (The transformation of technology: society and the technology of pineapple farming in Taiwan). 台中: 东海大学社会学系硕士论文.
- Wang Zuorong [Tso-yung Wang] 王作荣 et al. (1970) 台湾第二次土地改革刍议 (Taiwan needs a second agrarian reform). 台北: 环宇书局出版.
- Wu Tianquan 吴田泉 (1993) 台湾农业史 (A history of Taiwan's agriculture). 台北: 自立晚报出版.
- Xie Donghua 谢东华, Lin Chunhua 林淳华, and Zeng Xiuying 曾秀英 (2000) 大甲溪带电奔流 (The Dajia River basin). 台北: 时报文化出版.
- Xie Zhiyi 谢志一 (2002) 草根, 知识与黑珍珠: 屏东莲雾技术发展的脉络式研究 (Grassroots, knowledge, and the jambu: a contextual history of the wax apple technology in Pingdong). 世新社会发展研究所硕士论文.
- Yang Hongren [Hung-Jen Yang] 杨弘任 (2014) 社区如何动起来? 黑珍珠之乡的派系、在地

- 师傅与社区总体营造 ([English title]: Making a community work? A case study of Lin-Bien). 台北: 群学出版社.
- Yanaihara Tadao 矢内原忠雄 (2002) 日本帝国主义下之台湾 (Taiwan under Japanese imperialism). Trans. by Zhou Xianwen 周宪文. 台北: 海峡学术出版.
- Ye Shouli [Shou-li Yeh] 叶守礼 (2015) “小农经济现代变迁: 东势果农的商品化之路” (Modern changes in the peasant economy of Taiwan: the commercialization of the Dongshi fruit farmers). Master's thesis. 东海大学社会学系硕士论文.
- Ye Shouli (2017) “乡民生活世界: 农村社会学研究的田野反思” (Peasants' life world: reflections on field studies in rural sociology). 庶民文化研究 15: 107–134.
- Yeh, Shou-li (2016) “Transformation and tradition in Taiwan's peasant economy, 1960–2015: a case study of the Dongshi fruit economy.” *Rural China* 13, 2: 306–343.
- Yu Zongxian [Tzong-Shian Yu] 于宗先 (1975) 湾农业发展论文集 (Collection on Taiwan's agricultural development). 台北: 联经出版社.
- Zhang Hanyu 张汉裕 (1974) 经济发展与农村经济 (Economic development and the rural economy). 台北: 张汉裕博士文集出版委员会.
- Zhang Subin [Chang Su-bing] 张素玠 (2014) 浊水溪三百年: 历史、社会、环境 (The Zhuoshui River: three hundred years of history, society, and environment). 台北: 卫城出版社: 远足发行.
- Zhang Yantian [Yen Tian Chang] 张研田 (1980) 农企业的发展 (The development of agribusiness). 台北: 联经出版社.

Shou-li Yeh is a PhD student in the Graduate Institute of Sociology, Tunghai University.

His master's thesis won two thesis awards and a fieldwork award , and his doctoral dissertation on rural Taiwan attempts to understand the relationship between urban and rural areas in the post-industrial society of East Asia and the collective destiny of contemporary peasants.

Figure 1. Pear Production in Taiwan, 1955–2016



Based on data from Council of Agriculture, Executive Yuan 「行政院农业委员会农业统计数据查询数据库: 农产品生产量值统计」 (Agricultural statistics database: agricultural product production statistics), December 20, 2017,

<http://agrstat.coa.gov.tw/sdweb/public/inquiry/InquireAdvance.aspx>.

Table 1. Comparison of Number of Hours of Labor per Hectare for Six Crops in Dongshi, 2010

	Rice	Green plums	Citrus	Peaches	Sweet persimmons	Annual grafting pears
Male	121.59	417.6	624.6	697.1	895.9	1,107.9
Female	47.07	290.8	246.2	607.4	814.2	966.8
Total	168.66	708.4	870.8	1,304.5	1,710.1	2,074.7

Data source: same as in Figure 1.

Table 2. Comparison of Average Income per Hectare for Common Crops in Dongshi, 2000–2010  
(units: NT\$)

	Green plums	Citrus	Peaches	Sweet persimmons	Annual grafting pears
Income	258,817	478,688	656,704	690,569	1,097,876
Hired labor	92,756	155,850	232,744	271,588	347,022
Family labor	60,84	140,999	203,919	246,574	302,044
Surplus or deficit	93,895	204,248	216,784	158,099	233,959
Family labor remuneration	154,744	345,248	420,704	404,74	536,003

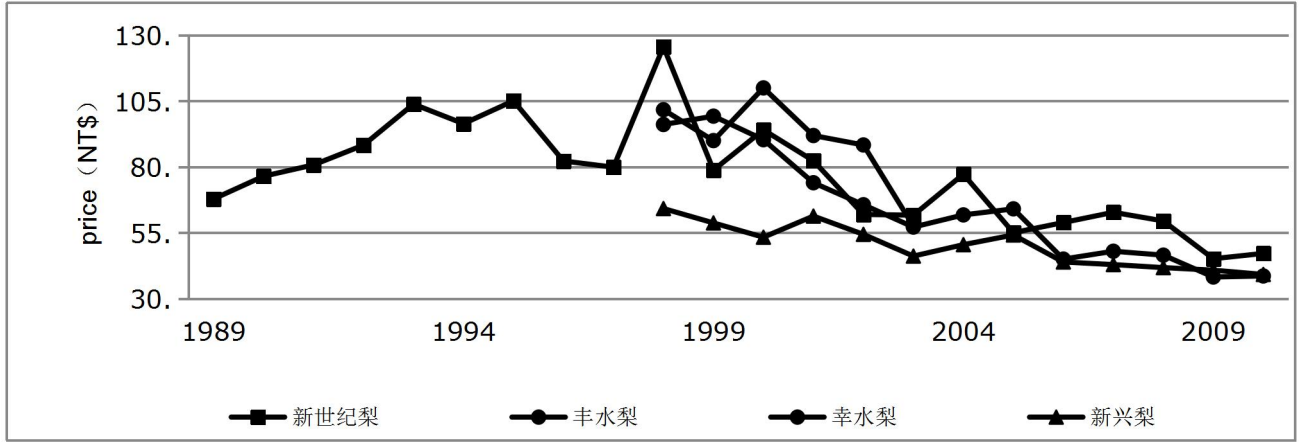
Data source: Same as in Figure 1.

Table 3. Simulated Annual Income of the Zhang Household from Citrus and Annual Grafting Pears, 2000–2010 (units: NT\$)

	Family labor	Family labor remuneration	Surplus or deficit
Citrus	183,299	448,822	265,523
Annual grafting pears	392,658	696,804	304,146

Data source: Same as in Figure 1.

Figure 2. Farm Price of Temperate Pears in Taiwan, 1989–2010



Data source: Council of Agriculture, Executive Yuan 「行政院农业委员会农业统计数据查询

数据库: 农产品生产量值统计」 (Agricultural statistics database: agricultural product

production statistics), December 20, 2017,

<http://agrstat.coa.gov.tw/sdweb/public/maintenance/Announce.aspx>.