

Declining Rice Consumption and the School Lunch Programs in Taiwan

By

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Introduction

The per capita rice consumption in Asian (including Japan, Taiwan, South Korea, and China) shares the common downward tendency since 1961. Particularly, there exists a dramatic decline in per capita rice consumption of Taiwan (Ito and Kako, 2005). This paper attempts to explore clues regarding the significant drop in per capita rice consumption of Taiwan.

The perception of nutrition about healthy should be influential on eating habits. The nutrition education we have had since we were in primary school should be fundamental to our eating habits. This is one of the possible reasons why this paper tries to investigate the relationship between rice consumption and contents of the school lunch programs in Taiwan.

However, we found that it seems difficult to find the connection between the drop in per-capita consumption of rice and the contents of school lunch programs in Taiwan. We identify the major changes in quantities of foods consumed in Taiwan since 1961. The relative changes in the prices of associated foods seem not be sufficient to explain the major changes in food consumption preferences in Taiwan. Under-consumption of carbohydrate and over-consumption of fat are indicated in the *Annual Report of Food Supply and Demand of Taiwan* in 2004. The ill-balanced eating habit tendency of Taiwan might explain the significant decline of per-capita rice consumption.

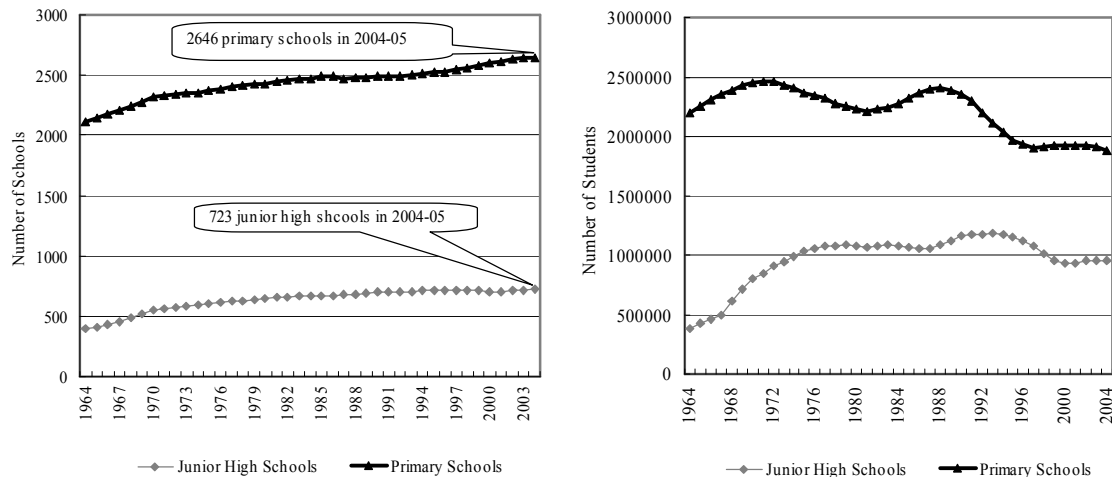
The structure of the paper is as follows. Section II introduces the history and current situation of the school lunch programs in Taiwan. Section III investigate preferences changes in food Consumption in Taiwan. The final section is the concluding remark.

II. The School Lunch Programs in Taiwan

1. Summary of Taiwan's compulsory education system

Taiwan has implemented a nine-year compulsory education program since 1968. Currently, the fundamental compulsory education consists of six years of primary education and three years of junior high education. Most primary and junior high schools are public in Taiwan. They are under the jurisdiction of local governments including counties and cities.

Private primary schools account for only about 1%. In 2004-2005, there are 2,646 primary schools and around 1900 thousand students. The ratio of primary students to teachers is 18:1. The number of primary students is declining since 1988. After the launching of the nine-year compulsory education, the number of junior high schools has increased from 458 to 723 (see Figure 1). In 2004-2005, out of 723 junior high schools, only 15 were private (about 2%). There are about 960 thousand students in Taiwan's junior-high schools but the number is also declining since 1993. The current ratio of junior high students to teachers in Taiwan is 16:1.



Original data source: the website of Department of Statistics, Ministry of Education, Taiwan (http://www.edu.tw/EDU_WEB/Web/STATISTICS/index.htm)

Figure 1. The numbers of primary and junior high schools and students in Taiwan: 1964-2004.

2. The brief history of the school lunch programs in Taiwan

Development of the school lunch programs in Taiwan can be traced back to early 1950s (Nan, 1995; Chung, 2002). Generally, it can be divided into three stages: foreign-aid stage, self-contained stage, and growing stage. The situations in every stage are described as follows.

Stage I: Foreign-aid stage (1950-1972)

This stage started in 1951 in which the United Nations donated nonfat milk powder to 151 primary schools in Taiwan for ill-fed students. During that time, Taiwan province selected five rural primary schools as demonstration for nutrition education in 1957. With the aid from U.S. and the UN, the Taiwan government launched several projects to support schools to have lunch programs. Until Taiwan's dropout from the Union in 1972, there were about 430 schools and 250 thousand students with the school lunch programs.

Stage II: Self-contained stage (1973-1981)

Without the support from foreign institutions, Taiwan's Ministry of Education started the *School Lunch Self-contained Project* in 1973. In this project, Taiwan's central government submitted the annual budget to fund the school lunch programs especially for rural schools. However, due to the limited budget, the number of schools with lunch programs did not grow until the late 1970s. In that time, the U.S. Wheat Associates help 12 schools to build supply centers for wheat-made foods including bread, steamed bread, and

noodles for neighborhood schools (Nan, 1995).

Stage III: Growing stage (1982-present)

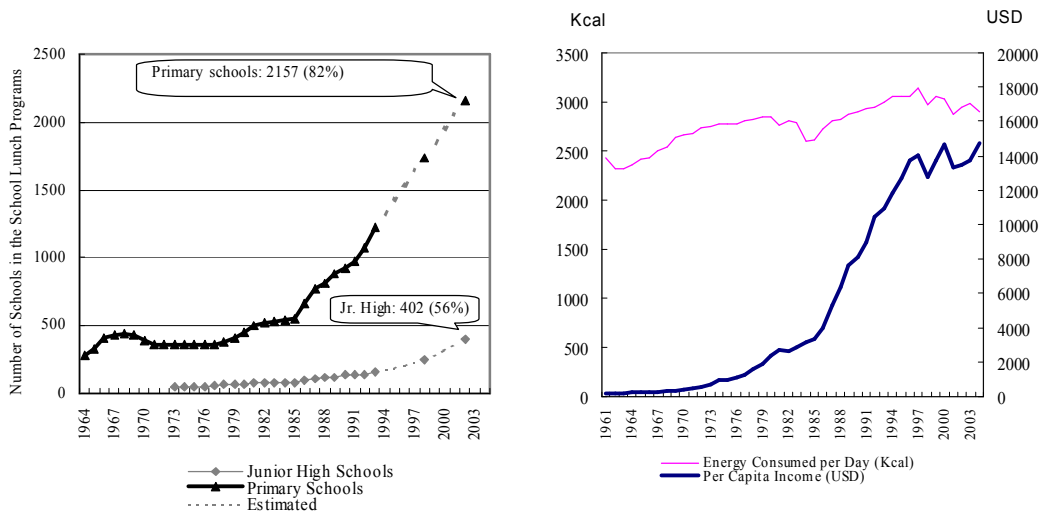
In 1982, Taiwan's government decided to expand lunch programs from rural schools to other schools in response to needs of parents and students. The *Six-year Project for Developing and Improving Compulsory Education* which included increased budgets for building and rebuilding kitchens as well as associated facilities was proposed by the central government in 1982. Due to this project, the number of schools with lunch programs in Taiwan started to grow increasingly after 1985.

The school lunch programs was then included in 1990's *Six-year National Construction Project* which aimed to finance more than 1000 schools for their lunch programs in five years. Two successive projects, the *Five-year Project for Improving School Lunches I and II*, launched respectively in 1992 and 1996 further funded the expansion of school lunch programs in Taiwan. In the meantime, a plan of rice subsidies named the *Distribution and Purchases of Rice for School Lunches Operation Guideline* was passed in 1991 to provide rice with 50%-off price to the schools with lunch programs (Nan, 1995). As shown in Figure 2, the number of primary schools with lunch programs in Taiwan increased from around 500 in 1982 to 2157 in 2002. The number of junior high schools with lunch programs also increased to 402 in 2002.¹ In addition, the percentages of primary and junior high schools with lunch programs were 82% and 56% in 2002, respectively.

In summary, the first stage of Taiwan's school lunch programs was to provide nutritious lunches to ill-fed or students with financial difficulties in the rural area of Taiwan. The policy mainly aimed for demonstration and experiments of the school lunch program in the second stage. In the third stage, government's policy was to expand the school lunch programs.

It can also be seen in Figure 2 that the expansion in Taiwan's school lunch programs was obviously associated with significant economic growth in Taiwan at that time. The income per capita in Taiwan increased from 3500 USD in 1985 to more than 12,000 USD in 2002. What followed was that the calories consumed per day per capita in Taiwan also went up from about 2600 Kcal in 1985 to the historical high 3135 Kcal in 1997. An over-weight problem then occurred in Taiwan's young students in recent years. This phenomenon raised another need to adjust the contents of the school lunch programs in Taiwan. This issue and associated adjustments will be discussed later.

¹ Note that the figures presented here excluded those schools which ordered lunch boxes from outside third parties. If these schools were included, the percentage of schools with lunch programs should go up to more than 95% in both primary and junior high schools (Nan, 1995).



Original data source: the website of Department of Statistics, Ministry of Education (http://www.edu.tw/EDU_WEB/Web/STATISTICS/index.htm) and the Council of Agriculture (http://stat.coa.gov.tw/dba_as/AS_root.htm), Taiwan.

Figure 2. The numbers of primary and junior high schools with lunch programs, calories consumes per day per capita, and income per capita in Taiwan: 1961-2004.

3. Current situations of the school lunch programs in Taiwan

The most recent statistics of Taiwan's school lunch program in 2002 (see Table 1) showed that there were 2157 primary schools and 402 junior high schools with lunch programs (ordering lunch boxes from third parties were excluded). In 2002, there were 82% of the primary schools with lunch programs and 56% of the junior high schools with lunch programs. If ordering lunch boxes is included, the percentages of schools with lunch programs went up to more than 95%. In terms of the students joining into the school lunch programs, note that there were 61% and 31% of primary and junior high students covered in the lunch programs.

3.1 The role of governments and policies

The central education administration authority in charge of the school lunch programs is the Department of Physical Education (DPE) of the Ministry of Education (MOE). The local (county/city) administration authority in charge of the lunch programs is the Physical and Health Education Section of local government's Bureau of Education.

Taiwan's central government plays a role of making national policies about the school lunch programs. For instance, Taiwan's Ministry of Education announced the *Guidelines for Food and Nutrition Facts of School Lunch Programs* to guide schools for preparing the school lunches in 1997. A draft amendment of the guidelines (MOE, 2005) was recently announced in 2005 to fit the current nutrition requirements recommended by the Department of Health in 2002. A suggested nutrition facts and ingredients of the school lunch for primary and junior high students are shown in Table 2 (a

bridged version selected from (MOE, 2005)). MOE also made general directions to regulate local government's management and operations of school lunch programs (MOE, 2004), such as the missions of local government committee of school lunch programs, the regulations for revenues and expenditures for the lunch programs. These guidelines and directions serve as a baseline to monitor the schools with the lunch programs.

The local governments in Taiwan are responsible to execution and implementation of the national policies regarding the school lunch programs. For example, the county/city government often made directions or guidelines for school's administration to operate the lunch programs (TPC, 1998; Chung, 2002). In addition, the local government typically subsidizes schools to provide free lunches for students with financial difficulties, to build new kitchens, and/or renovate the equipment of kitchens. However, the subsidy cannot be used to cover general variable costs and expenditures of the lunch program. The local government also hires dieticians to prescribe food list and starts education related to healthy lunches. The local authority periodically examines the quality of food in the lunch program, conducts hygiene courses for chefs and related personnel, solicits good manufacturer to secure the food safety in every school (TYC website, 2006).

Table 1. Selected year's numbers of primary and junior high schools with lunch programs in Taiwan.

Year	In the school lunch programs				Total primary schools	Total primary students	In the school lunch programs				Total junior high schools	Total junior high students
	Primary schools	%	Primary students	%			Junior high schools	%	Junior high students	%		
1964	283	13%	198,952	9%	2,107	2,202,867	-	-	-	-	396	382,998
1973	360	15%	192,454	8%	2,349	2,431,440	53	9%	26,924	3%	586	948,872
1982	522	21%	299,006	13%	2,457	2,226,699	83	13%	68,194	6%	661	1,082,358
1985	552	22%	326,481	14%	2,486	2,321,700	84	12%	63,763	6%	675	1,062,226
1993	1,225	49%	648,598	31%	2,505	2,111,037	159	22%	94,683	8%	708	1,187,370
1998	1,738	68%	-	-	2,557	1,910,681	247	35%	-	-	715	1,009,309
2002	2,157	82%	1,166,524	61%	2,627	1,918,034	402	56%	300,597	31%	716	956,823
2004	-	-	-	-	2,646	1,883,533	-	-	-	-	723	956,927

Original data source: the website of Department of Statistics, Ministry of Education, Taiwan

(http://www.edu.tw/EDU_WEB/Web/STATISTICS/index.htm), Nan (1995), and (Chung) 2002.

Note: the figures indicated in the table excluded the schools which ordered lunch boxes from third parties.

Table 2. The per-meal nutrition facts and ingredients of the school lunch for primary and junior high students (suggested by the Ministry of Education, Taiwan, 2005)

	For primary students		For junior high students
	1~3 grade	4~6 grade	
Energy (Kcal)	650	750	850
Protein (g) 12~14% of total energy consumed	20~23	23~26	25~30
Fat (g) less than 30% of total energy consumed	22	26	28
Calcium (mg)	280	350	420
Lunch Ingredients			
Staple food (rice, noodles, other cereals)	3 1/2 shares per day	4 1/2 shares per day	6 shares per day
	(substitutions of staple food cannot be more than 3 shares in a week)		
	rice and wheat at least 2 1/2 shares per day	rice and wheat at least 3 1/2 shares per day	rice and wheat at least 5 shares per day
	(rice has to be more than 1/2 of the daily staple food)		
	others at most 1share	others at most 1share	others at most 1share
Diary products	2 shares per week	2 shares per week	2 shares per week
Eggs, beans, fish, or meat	2 shares per day	2 shares per day	2 shares per day
	(substitutions of fishes and meat cannot be more than 1/2)		
Vegetables	1 shares per day (green or dark color vegetables have to be more than 2/3 share per day)	1 1/2 shares per day (green or dark color vegetables have to be more than 1 share per day)	2 shares per day (green or dark color vegetables have to be more than 1 share per day)
Fruit	1 share per day	1 share per day	1 share per day
Fat	2 1/2 shares per day	3 shares per day	3 shares per day

Source: The Guidelines for Food and Nutrition Facts of School Lunch Programs (MOE, 2005)
http://www.edu.tw/EDU_WEB/EDU_MGT/PHYSICAL/EDU7663001/health/lunch/910111.htm

Note: Per share of foods is defined as: 50g for steamed rice, 45g for raw noodles, 25g for bread, 200g/240cc for (whole fat or non-fat) milk, 55g for eggs, 110g for do-fu, 35g for fish and meat, 100g for vegetables, 100-200g for various fruits, 5g for cooking oil (fat).

3.2 The current lunch programs in Taiwan

According to a health survey on school children in 2000, Taiwan's authority recognized deterioration of young students' healthy. Many of them had serious problems of near-sight, dental caries, and over-weight. The central government (Executive Yuan, 2001) therefore started the *School Health Improvement Project* in 2001 in which the government manifested four education functions of the school lunch programs: nutrition education, health education, life education, and environmental education.

In general, there are three operations models of the school lunch programs in Taiwan. The first two models are termed "public-owned-public-managed" and "public-owned-private-managed" models. The public-owned-public-managed model means a school that has a kitchen and operates the school lunch program while the public-owned-private-managed model means a school that builds the

kitchen but outsources the operation of lunches to private firms. The third model is the "co-managed" model in which many neighborhood schools share a central kitchen and they co-manage the lunch program. Table 3 and 4 show the numbers of Taiwan's primary and junior high schools in each operations model of the lunch programs in 2002. It can be found that the public-owned-public-managed model is the most popular model for primary schools in Taiwan (67% of the primary schools operated in this model when ordering lunch boxes from outside were also counted in the school lunch programs). In the meanwhile, there were 44% of the junior schools operated in the public-owned-public-managed model. Note that 15 % of the primary schools (in Table 3) ordered lunch boxes from outside firms. This figure was smaller than that of the junior high schools (43%).

Table 3. Numbers of primary schools' lunch operations models in Taiwan (2002).

	Public- owned-publ ic-managed	%	Public-own ed-private- managed	%	schools with a central kitchen	%	schools in the co-manage d model	%	Ordering lunch boxes from outside	%	Total
宜蘭縣	48	57	28	33	0	0	0	0	0	0	76
基隆市	38	93	1	2	0	0	0	0	2	5	41
台北縣	61	31	0	0	9	5	11	6	109	55	190
桃園縣	107	61	37	7	0	0	0	0	63	36	177
新竹縣	77	92	0	0	1	1	4	5	2	2	84
新竹市	6	23	10	38	2	8	5	19	0	25	23
苗栗縣	90	68	2	2	0	0	0	0	41	31	133
台中縣	68	43	1	1	8	5	12	7	71	44	160
台中市	16	29	4	7	6	11	6	11	24	42	56
南投縣	146	97	0	0	0	0	0	0	5	3	146
彰化縣	97	55	0	0	0	0	0	0	78	45	175
雲林縣	154	99	0	0	0	0	0	0	0	0	154
嘉義縣	132	96	0	0	0	0	0	0	3	2	135
嘉義市	18	100	0	0	0	0	0	0	0	0	18
台南縣	172	100	0	0	0	0	0	0	0	0	172
台南市	19	44	0	0	8	18	9	21	7	17	43
高雄縣	146	98	0	0	0	0	0	0	1	2	147
屏東縣	84	42	13	7	36	18	47	24	18	9	198
台東縣	7	7	83	92	0	0	0	0	0	0	90
花蓮縣	80	78	2	2	5	5	16	16	0	0	103
澎湖縣	41	1	0	0	0	0	0	0	0	0	41
金門縣	18	90	2	10	0	0	0	0	0	0	20
連江縣	7	88	0	0	0	0	0	0	0	0	7
台北市	11	8	23	16	0	0	40	29	66	47	140
高雄市	81	98	2	2	0	0	0	0	0	0	83
Subtotal	1,724	67	208	8	75	3	150	9	490	15	2,612

Data source: the website of Department of Physical Education (DPE), Ministry of Education, Taiwan (http://www.edu.tw/EDU_WEB/EDU_MGT/PHYSICAL/EDU7663001/health/lunch.htm?TYPE=1&UNITID=126&CATEGORYID=208&FILEID=82411), Feb. 2002.

Note: There are 2627 primary schools in Taiwan in 2002.

Table 4. Numbers of junior high schools lunch operations models in Taiwan (2002).

	Public- owned-publ ic-managed	%	Public-own ed-private- managed	%	schools with a central kitchen	%	schools in the co-manage d model	%	Ordering lunch boxes from outside	%	Total
宜蘭縣	5	22	11	48	0	0	0	0	0	0	16
基隆市	6	38	0	0	0	0	0	0	10	63	16
台北縣	14	19	0	0	0	0	1	1	58	80	73
桃園縣	16	31	1	2	0	0	0	0	35	67	52
新竹縣	17	59	2	7	0	0	0	0	10	35	29
新竹市	0	0	6	46	0	0	0	0	0	0	6
苗栗縣	9	28	0	0	0	0	0	0	23	72	32
台中縣	9	18	0	0	2	4	0	0	39	78	50
台中市	9	35	5	19	1	4	1	4	10	38	26
南投縣	26	84	0	0	0	0	0	0	5	16	31
彰化縣	9	23	0	0	0	0	0	0	31	77	40
雲林縣	26	84	0	0	0	0	0	0	0	0	26
嘉義縣	16	64	0	0	0	0	0	0	5	2	21
嘉義市	1	13	0	0	0	0	0	0	7	88	8
台南縣	35	85	0	0	0	0	0	0	6	15	41
台南市	2	11	0	0	2	11	3	15	12	63	19
高雄縣	48	96	0	0	0	0	0	0	2	4	50
屏東縣	18	48	5	13	0	0	0	0	16	41	39
台東縣	2	9	18	81	0	0	0	0	2	9	22
花蓮縣	11	48	5	22	1	4	0	0	4	17	21
澎湖縣	12	86	1	14	0	0	0	0	0	0	13
金門縣	3	60	2	40	0	0	0	0	0	0	5
連江縣	4	80	0	0	0	0	0	0	0	0	4
台北市	0	0	0	0	0	0	0	0	57	100	57
高雄市	15	39	22	58	0	0	0	0	1	3	38
Subtotal	313	44	78	11	6	1	5	4	333	43	735

Data source: the website of Department of Physical Education (DPE), Ministry of Education, Taiwan (http://www.edu.tw/EDU_WEB/EDU_MGT/PHYSICAL/EDU7663001/health/lunch.htm?TYPE=1&UNITID=126&CATEGORYID=208&FILEID=82411), Feb. 2002.

Note: There are 716 junior high schools in Taiwan in 2002. Some of the schools might double counted.

3.3 The organization of school lunch programs

In any model of the school lunch program, a school lunch committee has to be formed in order

to supervise operations of the school lunch program. The chair of the committee usually is the principal and members of the committee include Directors of Educational, Student, and General Affairs Divisions, Section Chief of Hygiene, and representatives of parents. The committee has an executive secretary who is a teacher assigned by the chair. The executive secretary is allowed to reduce his/her normal teaching load. According to the *School Health Act* passed in 2002, the dietician is required only for a school whose class size is greater than 40. That is why a local government has to hire dieticians to assist those schools without dieticians. As mentioned earlier, the central government also provides guidelines for the school lunches' nutrition facts and food ingredients. Some examples of the menu of the school lunches as well as their nutrition facts and recipes are also available on Taiwan's MOE's website (see for instance, MOE (2005), shown in Figure 3).

In mid of 1990's, the menu designs of Taiwan's school lunch programs shifted to an emphasis on the balanced eating habit of students. In 1996's *Five-year Project for Improving School Lunches*, Taiwan's Ministry of Education started to stress on "low fat, low sugar, and appropriate calories" in designing school lunch menu. In 1997, the authority promoted the idea of "low salt, low fat, and high dietary fibre" in the lunch programs (Chung, 2002). In 2001, three-low-one-high (low fat, low salt, low sugar, and high dietary fibre) policy were announced (Executive Yuan, 2001). This policy has become the main target of the current school lunch programs on menu designs since 2001


In practice, the school lunch committee every month approves next month lunch menu. As you may see in Figure 3, a school lunch in Taiwan nowadays typically includes a staple food, 3 supplemental dishes, a soup plus one fruit. Some schools provide only 2 supplemental dishes (Nan, 1995). Dairy products are usually supplied twice a week. Four-day rice (most of them are steamed rice, sometimes fried rice) and one-day noodles are quite common. This may mainly be attributed to the 50%-off price policy for school-lunch rice since 1991.

3.4 Finances of the school lunch program

The *Directions for City and County Governments in Management of School Lunch Programs* (in 2004) formally regulates a *non-profit* operation rule for each school's lunch program. The items of school lunch fees and expenditure are explicitly expressed in the *Direction*. The usage of the surplus from the lunch programs is strictly restrained. The *Directions* authorize local government to issue another detailed directions to regulate the finance of school lunch programs. The school lunch fees and related regulations of the lunch program therefore vary among counties/cities and even among schools in the same county.

The school lunch fees in Taiwan usually consist of 3 items: (1) basic fee (each student pays once for a semester) which is paid for maintenance of kitchen facilities; (2) fuel fee (each student also pays once for a semester) which is paid for fuel; (3) lunch fee (each student pays once for a semester or 2 month a time) which is paid for lunches as well as labor fees of the lunch program.

The basic fee ranges from 3 USD to 19 USD (100 NTD to 600 NTD). The fuel fee is around 5 USD to 6 USD (150-200 NTD). The monthly lunch fee usually ranges from 19 to 25 USD (600-800 NTD). For example, Yunlin County (in central Taiwan) regulates that the school lunch fees cannot be more than 25 USD (800 NTD) (YCG, 2004). One school in Taipei County (in northern Taiwan) charges 19 USD (600 NTD) per month.² A school in Kaohsiung City (in southern Taiwan) charges 1.1 USD (35 NTD) per meal.³ A school in Hwalin (in eastern Taiwan) also charges 1.1 USD (35 NTD) per meal.⁴

	A	B	C	D	E	F
1		範例一				
2	星期一	烤雞排				
3		肉末冬瓜				
4		炒大陸妹				
5		綠豆薏仁湯				
6		白飯				
7		蓮藕				
8						
9	星期二	蘿蔔燒小排				
10		香菇蒸蛋				
11		蒜香菜豆				
12		海帶絲湯				
13		白飯				
14		橘子				
15		低脂保久乳				
16	星期三	茄汁肉醬				
17		烤鳳翅				
18		燙青花菜				
19		高麗濃湯				
20		通心麵				
21		蘋果				
22						
23	星期四	滷三寶				
24		羊肉白菜				
25		清炒菠菜				
26		雙耳湯				
27		地瓜飯				
28		芭樂				
29		低脂保久乳				
30	星期五	香酥魚排				
31		玉米火腿				
32		燙青江				
33		大黃瓜湯				
34		白飯				
35		香蕉				
36						

Data source: the website of Ministry of Education, Taiwan
(http://www.edu.tw/EDU_WEB/EDU_MGT/PHYSICAL/EDU7663001/health/unch/std/index.htm)

Figure 3. An example of the school lunch week menu demonstrated by the Ministry of Education, Taiwan in Apr.2005.

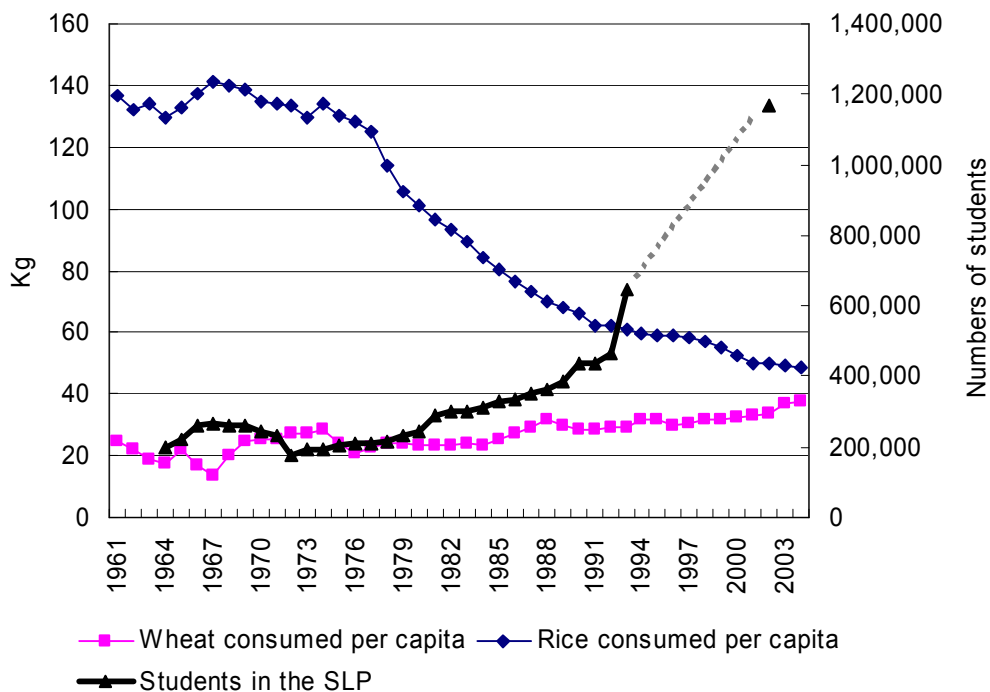
source: <http://163.20.102.5/school1/lunch.htm>.

source: <http://163.32.193.4/~dym666/data/n-001.htm>.

source: <http://tech1973.loxa.edu.tw/xoops/modules/mydownloads/viewcat.php?cid=6>

III. Preferences Changes in Food Consumption in Taiwan

Taiwanese consumption of rice per capita has dramatically declined since 1961. In Figure 4, it can also be found that yearly wheat consumption per capita is slightly increasing from 25kg in 1961 to 38kg in 2004 in the past four decades. During 1964-1972, The per capita rice consumption in Taiwan looks coincident with the number of students joining the school lunch programs. However, this connection disappeared after 1973 when Taiwan's school lunch programs went into the self-contained stage. Even with the policy of 50%-off rice price for school lunches in 1991, the per capita rice consumption in Taiwan continued to decline as we may see while the number of schools with the lunch programs increased in Figure 4. As a result, it is hard to conclude that the school lunch program and the 50%-off policy are influential factors on the drop of per capita rice consumption in Taiwan.



Original data source: the website of Department of Statistics, Ministry of Education (http://www.edu.tw/EDU_WEB/Web/STATISTICS/index.htm) and the Council of Agriculture (http://stat.coa.gov.tw/dba_as/AS_root.htm), Taiwan.

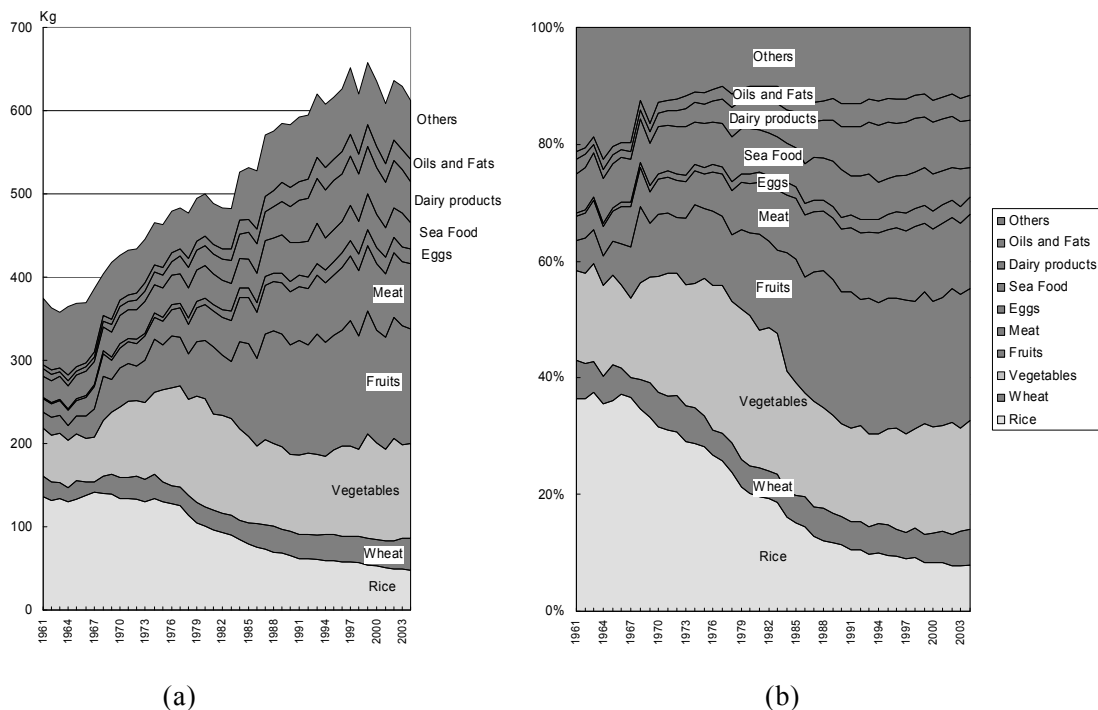
Figure 4. Rice and wheat consumed yearly per capita v.s. the number of students in the school lunch programs in Taiwan: 1961-2004.

Panel (a) in Figure 5 shows cumulative quantities of major food items consumed per capita in Taiwan from 1961 to 2004. It can be seen that the staple food (including rice and wheat) consumed is decreasing while the total consumption of foods is increasing per capita since 1961 in terms of food weights. In particular, per-year Taiwanese consumption of foods increases from 374 kg in 1961 to 612 kg in 2004. In words, the foods consumed by Taiwanese increase almost up to twice. The net

increase is 238 kg.

As we further examine the food consumption items of Taiwanese in the past four decades in Panel (b) of Figure 5, there are other four major items with significant changes in food consumption. These four items (including vegetables, fruits, meat, and dairy products) all show obvious tendency to increase in quantities per capita since 1961.

By comparison with the quantities of foods consumed in 1961, it can be found that vegetables consumed increase from 57 kg to 113 kg, fruits from 20 kg to 139 kg, meat from 16 kg to 78 kg, and dairy products from 9 kg to 50 kg. The total increase in these four items sums up to 278 kg (see Figure 6).



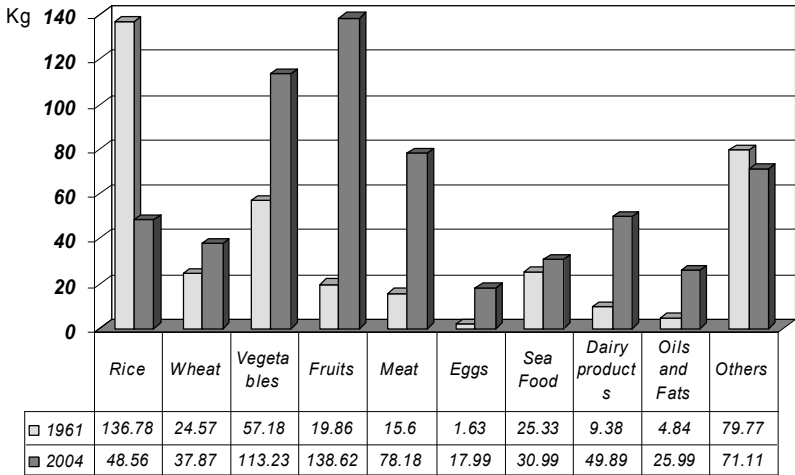
(a) Original data source: the website of the Council of Agriculture, Taiwan. (http://stat.coa.gov.tw/dba_as/AS_root.htm)

Figure 5. Food consumed and percentages of the ingredients per capita per year in Taiwan: 1961-2004.

If we compare the percentages of food items consumed per capita in 1961 with those in 2004 as shown in Figure 7, it is found that the share of rice in total food consumed drops from 36.5% to 8%. The share of fruits in total food consumed increases from 5.3% to 22.6% while meat increases from 5.3% to 12.8%.

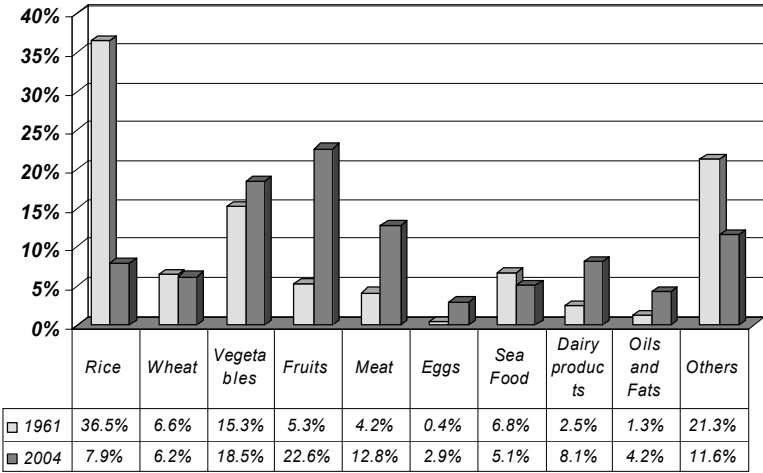
What might cause the significant changes in quantities of foods consumed is next step we are going to investigate. Figure 8 shows per-capita consumption of rice, vegetables, fruits, meat, and eggs per year since 1961. Figure 9 shows the selected prices of foods in Taiwan. We may see that the

price of cabbages generally increases since 1964.⁵ However, the quantities of vegetables consumer per capita started to increase in 1967, went up to the peak around 1980, and shifted down and up during 1981 and 2004.



Original data source: the website of the Concil of Agriculture, Taiwan. (http://stat.coa.gov.tw/dba_as/AS_root.htm)

Figure 6. Comparison of the food consumption in Taiwan: 1961 v.s. 2004.



Original data source: the website of the Concil of Agriculture, Taiwan. (http://stat.coa.gov.tw/dba_as/AS_root.htm)

Figure 7. Comparison of the food consumed in percentages in Taiwan: 1961 v.s. 2004.

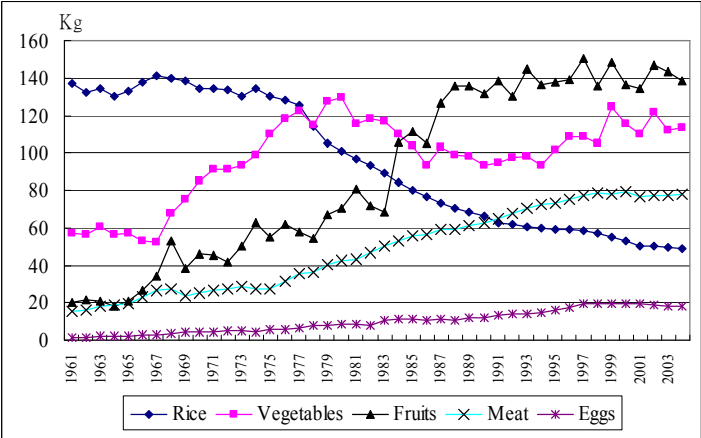
It is also found that the prices of pork and chicken tended to increase before 1982. The price of

⁵ The prices of other vegetables share the similar tendency of price movements to the prices of cabbages.

chicken then went down after 1982 while the price of pork varied a lot (see Figure 9). While we look at the per capita consumption of meat in Figure 8, it can be seen that it is increasing steadily in general. The prices and per capita consumption of eggs share similar tendency to per capita consumption of meat.

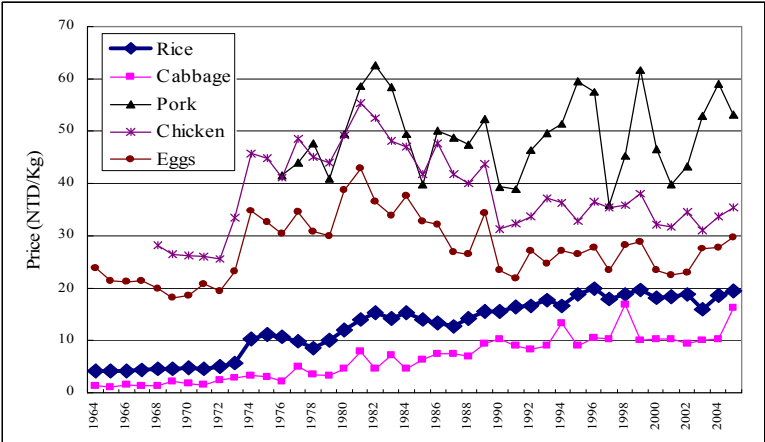
Finally, we may see that the prices of selected fruits in Figure 10 generally tended to increase as the price of rice does. As a result, changes in prices of fruits in Taiwan cannot explain the large increase in per capita consumption of fruits as shown in Figure 10.

In other words, the changes in prices of vegetables, fruits, meat, and eggs seem not to be suitable to explain the large increases in per capita consumption of vegetables, fruits, meat, and eggs. A possible reason for this phenomenon is due to the preference changes of food consumption in Taiwan.



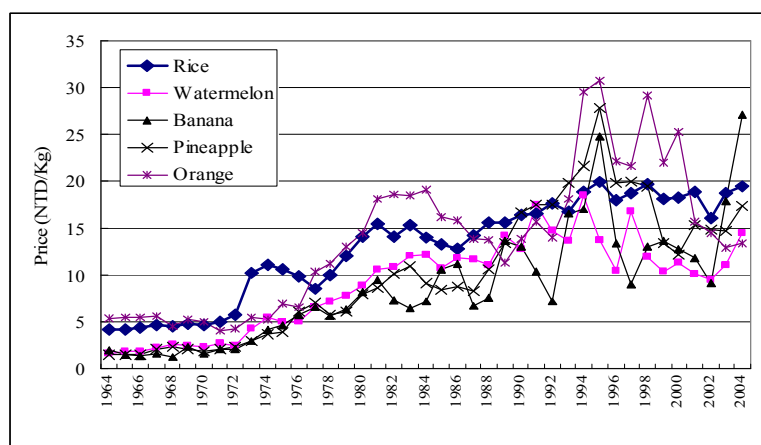
Original data source: the website of the Council of Agriculture, Taiwan. (http://stat.coa.gov.tw/dba_as/AS_root.htm)

Figure 8. Selected items of foods consumed per capita per year in Taiwan: 1961-2004.



Original data source: the website of the Council of Agriculture, Taiwan. (http://stat.coa.gov.tw/dba_as/AS_root.htm)

Figure 9. Selected prices of foods in Taiwan: 1964-2005.



Original data source: the website of the Concil of Agriculture, Taiwan.
(http://stat.coa.gov.tw/dba_as/AS_root.htm)

Figure 10. Selected prices of fruits in Taiwan: 1964-2004.

According to the analysis of the *Annual Report of Food Supply and Demand of Taiwan* in 2004 (<http://bulletin.coa.gov.tw/view.php?catid=9907>), it was indicated that consumption of carbohydrate was less than the ideal value and there was over-consumption of fat in Taiwan. This is evident if we compare the energy, protein, and fat consumed internationally as shown in Table 5. Taiwanese seem to consume more protein and fat compared with other Asian people.

Table 5. International comparison of energy, protein, and fat consumed per day in 2000-02 (selected countries).

Country	Total calories (Kcal)	Protein (g)	Fat (g)
Taiwan, R.O.C.	2,874	94.8	95.7
China	2,958	82.2	86.9
India	2,420	56.4	50.6
Indonesia	2,912	64.8	59.4
Japan	2,783	92.1	86.0
Korea, Rep. of	3,059	88.2	75.7
Malaysia	2,891	76.2	83.3
Philippines	2,375	55.9	47.8
Saudi Arabia	2,844	74.7	85.7
Thailand	2,453	56.6	50.6
France	3,634	118.5	169.4
Germany	3,474	98.6	144.6
United Kingdom	3,397	101.3	141.2
Canada	3,550	106.1	146.4
U.S.A.	3,794	114.2	156.7

Source: Food balanced sheet of Taiwan
(http://bulletin.coa.gov.tw/htmlarea_file/web_articles/6157/5.6-2.xls)
Note: the figures are averages of 2000-2002

IV. Concluding Remarks

The interest phenomenon of dramatic decline in per capita rice consumption in Taiwan since 1961 is the motivation of this paper to explore the causes. The nutrition education within the school lunch programs should have impacts of students on eating habits. The history of school lunch programs in Taiwan and the current situation of the programs were introduced in this paper.

There were 2157 primary schools and 402 junior high schools with lunch programs (ordering lunch boxes from third parties were excluded) in Taiwan in 2002. In the meantime, there were 82% of the primary schools with lunch programs and 56% of the junior high schools with lunch programs in Taiwan. Note that there were only 61% and 31% of primary and junior high students covered in the lunch programs.

It was shown that the schools with the lunch programs started to grow in 1973 while the per-capita consumption of rice continued to shrink in Taiwan. As a result, there exist weak connections between the drop in per capita rice consumption and the school lunch programs in Taiwan. Particularly, a 50%-off policy of rice price for Taiwan's school lunch programs has been established since 1991.

It was also indicated that the rice and wheat consumed decreased while the total consumption of foods increased per capita since 1961 (per-year Taiwanese total consumption of food per capita increases from 374 kg in 1961 to 612 kg in 2004). The authority of Taiwan has raised a warning of under-consumption of carbohydrate and over-consumption of fat for Taiwanese in 2004. It was also consistent with international comparison. However, going on a diet is still a fashion in Taiwan despite there seems to exist a contradiction in the phenomenon of under-consumption of carbohydrate and over-consumption of fat for Taiwanese.

References

- Chung, C. M.(2002) *The Study of Problems Relating to Lunch Program in Junior High Schools in Kaohsiung County*, master thesis, National Sun Yat-sen University (in Chinese).
- DPE (2002), *The Statistics of Primary and Junior High School Lunch Programs in Taiwan* (Excel file),
http://www.edu.tw/EDU_WEB/EDU_MGT/PHYSICAL/EDU7663001/health/lunch.htm?TYPE=1&UNITID=126&CATEGORYID=208&FILEID=82411), (in Chinese)
- DPE (2005) *Amendment of the Guidelines for Food and Nutrition Facts of School Lunch Programs and Report for Examples of Lunch Menu*, Department of Physical Education, Ministry of Education, Taiwan,
http://www.edu.tw/EDU_WEB/EDU_MGT/PHYSICAL/EDU7663001/health/lunch/std/index.htm (in Chinese).
- Executive Yuan (2001) *The School Health Improvement Project*,
<http://mail.mcjh.kl.edu.tw/~nurse/photo1.htm> (in Chinese).
- Ito, S. and T. Kako (2005) "Rice in the World Verging on a Grave Crisis," *Farming Japan*, col. 39, p.10-31.
- MOE (2004) *The Directions for City and County Governments in Management of School Lunch Programs*,
http://www.edu.tw/EDU_WEB/EDU_MGT/PHYSICAL/EDU7663001/health/lunch/930413.doc (in Chinese).
- MOE (2005) *The Guidelines for Food and Nutrition Facts of School Lunch Programs*
http://www.edu.tw/EDU_WEB/EDU_MGT/PHYSICAL/EDU7663001/health/lunch/910111.htm (in Chinese).
- Nan, C. T (1995) *Studies on the School Lunch Program in Taiwan and Korea*, master thesis, Chinese Culture University (in Chinese).
- TPC (1998) *The Directions of School Lunch Program for Taipei's Primary and Junior High Schools*, Bureau of Education, Taipei City Government.
- TYC (2006) the website of Bureau of Education, Tao-Yuan County,
<http://www.tyc.edu.tw/english/spo.htm> (in Chinese).
- YCG (2004) *The Directions of Various Charges for Public and Private Junior High and Primary Schools in Yunlin County*, Yunlin County Government,
http://www1.yunlin.gov.tw/traffic/web_law/message_view.asp?notice_id=974 (in Chinese).