Material 5-I

Final Report
Electric Rice Cooker Criteria Standard Subcommittee, Energy Efficiency Standards Subcommittee of the Advisory Committee on Energy and Natural Resources

Listed below are the final report on the Electric Rice Cooker Criteria Standard Subcommittee resulting from discussions about the standards for manufacturers and importers (hereafter referred to as manufacturers) to evaluate the improvement of the performance of rice cookers.

1. Target Scope [Reference: Attachment 1]

Targets are electric rice cookers. These exclude rice cookers for industrial use, mechanical rice cookers, rice cookers without thermal function and rice cookers with a maximum capacity of under 0.54L

2. Items to Serve as Criteria for Manufacturers

(1) Target Fiscal Year [Reference: Attachment 2]

Fiscal year Heisei 20 (fiscal year 2008)

(2) Target Standard Values [Reference: Attachments 3 and 4]

With respect to electric rice cookers that manufacturers will ship domestically in the target fiscal year, the weighted average value for each category below should not exceed the target standard values. It is calculated by averaging out the measured energy efficiency (annual energy consumption) per number of units shipped for each manufacturer, and the measurement method for the energy efficiency will be discussed in (3).

Category			Formula for Target Standard Value
Heating System	Maximum Rice Cooking Capacity	Category Name	
Electromagnetic Induction Heating System Products	≥ 0.54 to < 0.99 L	A	E_K=0.209M+48.5
	≥ 0.99 to < 1.44 L	B	E_K=0.244M+83.2
	≥ 1.44 to < 1.80 L	C	E_K=0.280M+132
	1.80 L and over	D	E_K=0.252M+132
Non-Electromagnetic Induction Heating System Products	≥ 0.54 to < 0.99 L	E	E_K=0.209M+36.7
	≥ 0.99 to < 1.44 L	F	E_K=0.244M+75.6
	≥ 1.44 to < 1.80 L	G	E_K=0.280M+99.0
	1.80 L and over	H	E_K=0.252M+122

(Note 1) The maximum rice cooking capacity is determined by multiplying the volume (L) of a measuring cup (specified by a manufacturer) by the maximum number of cups which a product is designed for.

(Note 2) E_K and M represent the following numerical values.

E_K: Standard energy efficiency (Unit: kilowatt hour per year.)

M: Mass of Water Evaporation (As specified in Attachment 5, it is the mass of water expelled from the rice cooker when measuring energy consumption per cooking rice, and it is the average value of all values obtained at measuring energy consumption during cooking rice. Further, the mass of water expelled from a rice cooker is calculated by subtracting measured weight of the rice cooker within one minute after the completion of cooking prior to opening the lid from weight of the rice cooker containing water and rice before start cooking. The value is express in grams, and it's rounded off to one decimal place.)

(3) Measuring Methods for Energy Efficiency [Reference: Attachment 5]

The energy efficiency of electric rice cookers is the annual energy consumption [kWh/year] and derived from the following equation.

The values for N_A, H_B, H_C, and H_D are shown in Table 1 below.

$E = \{(A \times N_A) + (B \times H_B) + (C \times H_C) + (D \times H_D)\}/1000$

The variables (E, A, N_A, B, H_B, C, H_C, D and H_D) in the equation express the following values:

E: Energy efficiency [kWh/year]

A: Energy in cooking mode per use [Wh/use]

N_A: Number of use per year [use/year]

B: Energy to keep rice warm per hour [Wh/h]

H_B: Hours of keeping rice warm per year [h/year]

C: Energy in timer mode per hour [Wh/h]

H_c: Hours in timer mode per year [h/year]

D: Energy in standby mode per hour [Wh/h]

H_D: Hours in standby mode per year [h/year]

Table 1. Coefficients of Formula for Energy Efficiency Calculation

Maximum Rice Cooking Capacity [L]	N_A	H_B	H_C	H_D
≥ 0.54 to < 0.99 L	290	920	750	2,760
≥ 0.99 to < 1.44 L	340	1,540	1,190	2,990
≥ 1.44 to < 1.80 L	390	2,180	1,880	1,210
1.80 L and over	350	2,420	1,000	2,150

(4) Information to be displayed

Items to be displayed shall follow the provisions in the Household Goods Labeling Law. The items concerning energy-saving shall be as follows.

1) Display items

a) Category
b) Maximum rice cooking capacity
c) Mass of evaporated water
d) Energy efficiency
e) Energy per use of a rice cooker
f) Energy to keep rice warm per hour
g) Energy in timer mode per hour
h) Energy in standby mode per hour
i) Name of manufacturer

*Regarding display of a) and c) through h) in the above, revision of the Electric Machinery and Appliance Quality Labeling Legislation is required.

2) Compliance requirements

(1) The energy efficiency is expressed in three significant figures or more with a unit of kilowatt-hour per year. In this case, the display value has to be within the rage of 97~103 % of the energy efficiency
(2) Energy per use and energy to keep rice warm per hour are expressed in three significant figures or more with a unit of watt per hour.
(3) Energy in timer mode per hour and energy in standby mode per hour are expressed in two significant figures and more with a unit of watt per hour.
(4) Mass of evaporated water is expressed in grams, and rounded off to one decimal place.
(5) The display items listed in this section has to be clearly displayed in the catalogs and owners manuals which contain information about performance of a product, so that a customer can select a product according to them.
(6) As for the display items c), g), and h), if the space for the display items in a catalog is limited, these three can be omitted.

3. Recommendations for Energy Conservation

(1) Efforts by Users

1. Users will strive to purchase electric rice cookers with superior energy efficiency, and also to use it appropriately and efficiently in order to reduce energy consumption
2. Especially, in order to save energy, users will strive to refrain from using warm mode over long periods of time. Instead, they may refrigerate or freeze the cooked rice and heat it with a microwave oven when necessary.

(2) Efforts by Vendors

1. Vendors will strive to promote electric rice cookers with superior energy efficiency. Also, by using “energy efficiency labels”, venders will strive to provide appropriate information so that consumers can select energy-efficient electric rice cookers. Upon using the “energy efficiency labels”, vendors should clearly display them and prevent users from misunderstandings.

(3) Efforts by Manufacturers

1. Manufacturers will promote technological development in order to improve the energy efficiency of electric rice cookers and strive to produce products with higher energy efficiency.
2. Aiming at penetration of energy-efficient electric rice cookers, manufacturers will plan the swift implementation of “energy efficiency labels” and will strive to provide appropriate information so that users will purchase them. Upon using energy efficiency labels, manufacturers should clearly display them and prevent users from misunderstandings.

(4) Efforts by the Government

1. Aiming at dissemination of energy-efficient electric rice cookers, the government will promote the efforts of users and manufacturers and will take the necessary measures to foster it.
2. The government will regularly and continually work to understand the implementation status of displaying information by manufacturers. The government will strive to employ appropriate laws so that manufacturers provide users with accurate and comprehensible information about energy efficiency of products.

3. With respect to energy efficiency standards based on the Top Runner System, since it is a highly effective method for improving products' energy efficiency, the government will take the appropriate opportunities to promote the system internationally.

Attachment 1

Target Scope

These evaluation standards will apply to all electric rice cookers, except the followings listed below.

- Electric Rice Cookers for Industrial Use
  Electric rice cookers for industrial use are excluded, because they are made for specific applications, as well as because the number of units manufactured is extremely low (around 300 units).

- Mechanical Rice Cookers
  Mechanical rice cookers gradually decline in number (from 365,000 units in fiscal year 1996 to 46,000 units in fiscal year 2003), and their improvement is extremely limited because of the simple heating system. Therefore, mechanical rice cookers are excluded from the target scope.

- Rice Cookers Without Thermal Function
  Currently, non-mechanical rice cookers without thermal function are not available in the market. Moreover, it is unexpected that these rice cookers will be shipped in the future. Accordingly, they are excluded from the target scope.

- Rice Cookers with Maximum Capacity of Under 0.54 L
  Rice cookers with maximum capacity of under 0.54 L are excluded, because non-mechanical rice cookers with the maximum capacity of under 0.54 L do not exist in the current market and will not be expected in the future market also.

Attachment 2

Target Fiscal Year for Electric Rice Cookers

1. Generally speaking, energy efficiency of electric rice cookers significantly improves as model change, and it normally takes about a year to develop a new model. Therefore, it is necessary to allow for at least two opportunities to change models until the target fiscal year.

   On the other hand, from the standpoint of countermeasures against global warming, assuming the tenure of use of a electric rice cooker is approximately 7 years, it is desirable that products achieve the target standard value as soon as possible. It influences on the sufficient penetration of these achieved products within the first promised period (from 2008 until 2012) of the Kyoto Protocol.

   Based on the above, with respect to the target fiscal year for electric rice cookers, Heisei fiscal year 20 (fiscal year 2008), which is 3 years after the set of this standard, will be appropriate.

2. In addition, the improvement rate of energy efficiency for each category at the target fiscal year is expected to be around 11.1%, if there is no change in the current number of units shipped as well as in the composition of each category (actual results in fiscal year 2003).

< Description of the Trial Calculation >

(1) The energy efficiency estimated from the past results of electric rice cookers shipped in fiscal year 2003: 119.2 kWh/year.

(2) The energy efficiency estimated from the target standard value of electric rice cookers shipped in the target fiscal year: 106.0 kWh/year

(3) The improvement rate of energy efficiency:

$$\frac{(119.2-106.0)}{119.2}\times 100 = \text{Approx. } 11.1\%$$

Attachment 3

Electric Rice Cooker Categories

1. Basic Approach

Since heating system and maximum capacity of electric rice cookers significantly affect energy efficiency, electric rice cookers are categorized based on these factors.

2. Specifics of Categorizing Method

(1) Categorization according to heating system

The heating systems in electric rice cookers include microcomputer types and induction heating (IH) types. Since the differences between these two types will effect energy efficiency and future developments of energy saving technologies, it is appropriate to categorize electric rice cookers according to the types of heating system that they employ. (Reference: Figure 1)

The microcomputer type is an electric rice cooker which heats its inner pot by a heater located in the base, and the heater warms up when electric current flows. The IH type employs electromagnetic induction heating system. Electric current flows to a coil located in the base of a rice cooker, and it generates lines of magnetic force. As a result, eddy current flows into its inner pot which is made of iron and/or stainless-steel, and the pot itself generates heat to cook rice. It was developed with the aim of improving the taste of cooked rice.

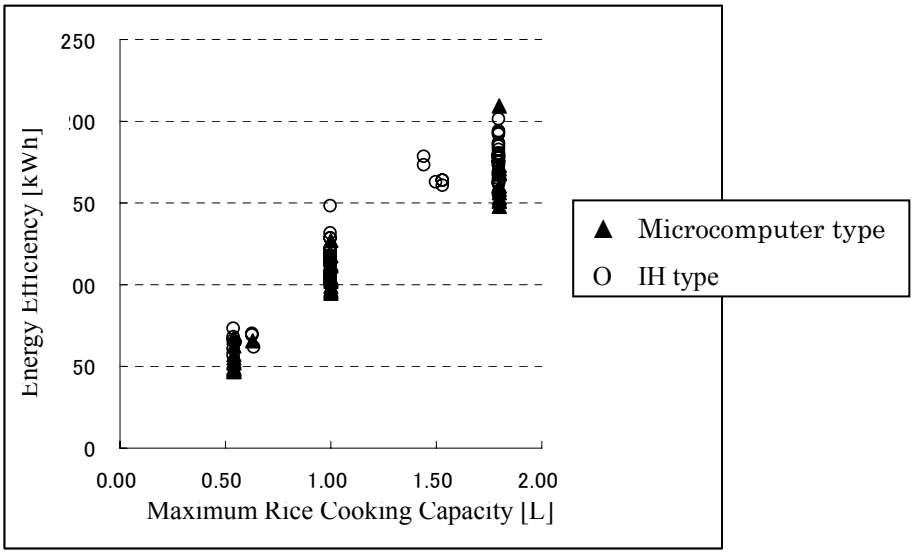


Figure 1 Maximum Rice Cooking Capacity – Energy Efficiency

However, since IH type rice cookers also use microcomputers, in order to avoid confusion of these terms, rice cookers will be categorized into magnetic induction heating rice cookers (IH type rice cookers) and non-magnetic induction heating rice cookers (microcomputer type rice cookers).

1) Magnetic induction heating type products

2) Non-magnetic induction heating type

(2) Categorization according to the maximum rice cooking capacity

Because household makeup varies, the maximum rice cooking capacities[1] of electric rice cookers that consumers purchase also varies. Differences in the maximum capacities result in differences in the size of rice cooking pot, the actual usage patterns and other factors. Because these factors also affect energy efficiency, it is appropriate to categorize electric rice cookers based on their maximum rice cooking capacities.

Microcomputer type electric rice cookers are currently available with 0.54L, 0.63L, 0.99L, or 1.80L. IH type electric rice cookers are currently available with 0.54L, 0.55L, 0.63L, 0.99L, 1.44L, 1.50L, 1.53L, or 1.80L. Thus, these products are classified according to the maximum rice cooking capacity. At the time of classification, in order to avoid achieving a desired class by decreasing the maximum rice cooking capacity without technological development, electric rice cookers have to be classified to make each existing rice cooking capacity be the minimum for each class.

However, we find that the maximum rice cooking capacity of electric rice cookers varies somewhat among manufacturers (for example, 0.55L and 0.63L), even though both these capacities meet consumers' purpose. Minute classification results in establishing many useless classes and hindering the progress of energy conservation. Therefore, 0.55L and 0.63L are classified into the same class as described below.

1) Maximum rice cooking capacity: ≥ 0.54 to < 0.99 L

2) Maximum rice cooking capacity: ≥ 0.99 to < 1.44 L

3) Maximum rice cooking capacity: ≥ 1.44 to < 1.80 L

[1]The maximum rice cooking capacity is the maximum amount of milled rice that a electric rice cooker is designed to cook. Specifically, the numerical figure is determined by multiplying the volume (L) of a measuring cup (specified by a manufacturer) by the maximum number of cups which a product is designed for.

4) Maximum rice cooking capacity: 1.80 L and over

3. Proposed Basic Categorization

Based on the above, the basic categorization is proposed in the table below.

Category Name	Heating System	Maximum Rice Cooking Capacity
A	Electromagnetic Induction Heating	≥ 0.54 to < 0.99 L
B		≥ 0.99 to < 1.44 L
C		≥ 1.44 to < 1.80 L
D		1.80 L and over
E	Non-Electromagnetic Induction Heating	≥ 0.54 to < 0.99 L
F		≥ 0.99 to < 1.44 L
G		≥ 1.44 to < 1.80 L
H		1.80 L and over

Attachment 4

Target Standard Values for Electric Rice Cookers

1. Approach to Establishing Target Standard Values

(1) Basic Approach

The target standard values are established based on Top Runner Program approach. Specifics of this approach are described below.

1. The target standard value is established for each category which is set properly.
2. The target standard values reflect expected future improvements in efficiency resulting from technological progress as much as possible.
3. Any inconsistencies should not arise in the target standard values between categories.

(2) Setting Target Standard Values

Energy to cook rice which accounts for the most of annual energy consumption of rice cooker correlates positively with mass of evaporated water (Reference: Figures 1 and 2). Recent electric rice cookers feature technologies to improve taste of rice. In these technologies, a large volume of water is used during cooking in order to break down the combination of starch and micelle as much as possible, and no free water is left inside rice when it's cooked because of greater mass of evaporated water. Therefore, when the target standard values simply adopt the values of models with low annual energy consumption in each class, there is a strong possibility that this significantly disturbs the future improvement of taste of cooked rice. On that account, the target standard values (annual energy consumption) are expressed in a linear function formula (calculation formula) with a variable of mass of evaporated water. The calculation formal is developed through the following process.

To start, calculate the theoretical value of energy in cooking mode required to evaporate 1 gram of water, and find the slope of the correlation between energy to cook rice and mass of evaporated water. Next, multiply the slope by annual number of uses for each class, and find the slope of the correlation between mass of evaporated water and annual energy consumption. Based on this slope, set the

calculation formula to minimize the intercept for all complete data in every class. With respect to the improvement in efficiency that are expected by the target fiscal year, it is obtained by translating the original calculation formula downward.

(3) Improvement in Energy Efficiency with Future Technological Development

The technological development of electric rice cookers is implemented mainly for the purpose of improving taste of cooked rice. While technologies to improve energy efficiency are developing, it seems that a room still remains for it.

Improvement in energy efficiency of rice cookers is expected from advancement of thermal insulation performance. Consequently, comprehensive consideration is given to these efficiency improvement factors, and the target standard values are set at 2 % above the standard value of Top Runner Program.

2. Specifics of Target Standard Values

The target standard values of electrical rice cookers are expressed in a linear function formula (calculation formula) with a variable of mass of evaporated water. To find the slope of the formula, first we look for the theoretical value for the slope of the correlation between mass of evaporated water and energy to cook rice.

> The energy in cooking mode required to evaporate 1 gram of water = {539 (water vaporization heat: cal/g) + 77 (the amount of heat to heat water from 23℃ to 100℃: cal/g)} x 4.2/3600 (cal-Wh conversion coefficient) = 0.719 [Wh/g]

Next, multiply the slope by annual number of uses for each class, and find the correlation between mass of evaporated water and energy efficiency (annual energy consumption) (Reference: Table 1). Then, we look for the intercept by translating a formula with the slope described above until reaching the maximum energy efficiency for each category (Reference: Table 2 and Figures 3-9).

In addition, with respect to the class of ≥1.44 to <1.80L, there is no electric rice cookers available other than ones with electromagnetic induction heating system. Considering the fact that energy efficiency increases in a linear fashion as the maximum cooking capacity increases, for these non-electromagnetic induction heating products, the midpoint of the 2 classes (≥0.99 to <1.44L, 1.80 L and over) is adopted as the intercept for the class (≥1.44 to <1.80L).

Furthermore, in the class of ≥1.44 to <1.80L for electromagnetic induction heating products, its Top Runner value is higher than the Top Runner value of the following class (1.80L and over) (negative correlation). For that reason, the intercept for the top

class (1.80L and over) is applied to the class of ≥1.44 to <1.80L (Reference: Table 3).

Table 1 Correlation of Mass of Evaporated Water

Heating System	Maximum Rice Cooking Capacity	Slope of Calculation Formula [kWh/g]
Electromagnetic induction heating system	≥ 0.54 to < 0.99 L	0.209
	≥ 0.99 to < 1.44 L	0.244
	≥ 1.44 to < 1.80 L	0.280
	1.80 L and over	0.252
Non-electromagnetic induction heating system	≥ 0.54 to < 0.99 L	0.209
	≥ 0.99 to < 1.44 L	0.244
	≥ 1.44 to < 1.80 L	0.280
	1.80 L and over	0.252

Table 2 Top Runner Values and Target Standard Values

(before adjusting the negative correlation)

Heating System	Maximum Rice Cooking Capacity	Formula for Energy Efficiency (Top Runner Value)	Improved Efficiency [%]	Formula for Target Standard Value
Electromagnetic induction heating system	≥ 0.54 to < 0.99 L	E_K=0.209M+49.5	2.0	E_K=0.209M+48.5
	≥ 0.99 to < 1.44 L	E_K=0.244M+84.9	2.0	E_K=0.244M+83.2
	≥ 1.44 to < 1.80 L	E_K=0.280M+137	2.0	E_K=0.280M+134
	1.80 L and over	E_K=0.252M+135	2.0	E_K=0.252M+132
Non-electromagnetic induction heating system	≥ 0.54 to < 0.99 L	E_K=0.209M+37.4	2.0	E_K=0.209M+36.7
	≥ 0.99 to < 1.44 L	E_K=0.244M+77.1	2.0	E_K=0.244M+75.6
	≥ 1.44 to < 1.80 L	E_K=0.280M+101	2.0	E_K=0.280M+99.0
	1.80 L and over	E_K=0.252M+124	2.0	E_K=0.252M+122

E_K: Standard energy efficiency [kWh/year]
M: Mass of evaporated water [gram]
(Note) Mass of Water Evaporation (As specified in Attachment 5, it is the mass of water expelled from the rice cooker when measuring energy consumption per cooking rice, and it is the average value of all values obtained at measuring energy consumption during cooking rice. Further, the mass of water expelled from a rice cooker is calculated by subtracting measured weight of the rice cooker within one minute after the completion of cooking prior to opening the lid from weight of the rice cooker containing water and rice before start cooking. The value is express in grams, and it's rounded off to one decimal place.)

Table 3 Top Runner Values and Target Standard Values

(after adjusting the negative correlation)

Heating System	Maximum Rice Cooking Capacity	Formula for Energy Efficiency (Top Runner Value)	Improved Efficiency [%]	Formula for Target Standard Value
Electromagnetic induction heating system	≥ 0.54 to < 0.99 L	E_K=0.209M+49.5	2.0	E_K=0.209M+48.5
	≥ 0.99 to < 1.44 L	E_K=0.244M+84.9	2.0	E_K=0.244M+83.2
	≥ 1.44 to < 1.80 L	E_K=0.280M+135	2.0	E_K=0.280M+132
	1.80 L and over	E_K=0.252M+135	2.0	E_K=0.252M+132
Non-electromagnetic induction heating system	≥ 0.54 to < 0.99 L	E_K=0.209M+37.4	2.0	E_K=0.209M+36.7
	≥ 0.99 to < 1.44 L	E_K=0.244M+77.1	2.0	E_K=0.244M+75.6
	≥ 1.44 to < 1.80 L	E_K=0.280M+101	2.0	E_K=0.280M+99.0
	1.80 L and over	E_K=0.252M+124	2.0	E_K=0.252M+122

E_K: Standard energy efficiency [kWh/year]
M: Mass of evaporated water [gram]
(Note) Mass of Water Evaporation (As specified in Attachment 5, it is the mass of water expelled from the rice cooker when measuring energy consumption per cooking rice, and it is the average value of all values obtained at measuring energy consumption during cooking rice. Further, the mass of water expelled from a rice cooker is calculated by subtracting measured weight of the rice cooker within one minute after the completion of cooking prior to opening the lid from weight of the rice cooker containing water and rice before start cooking. The value is express in grams, and it's rounded off to one decimal place.)

Reference:

1. Correlation of Mass of evaporated water and energy in cooking mode

(1) Electromagnetic Induction Heating System Products

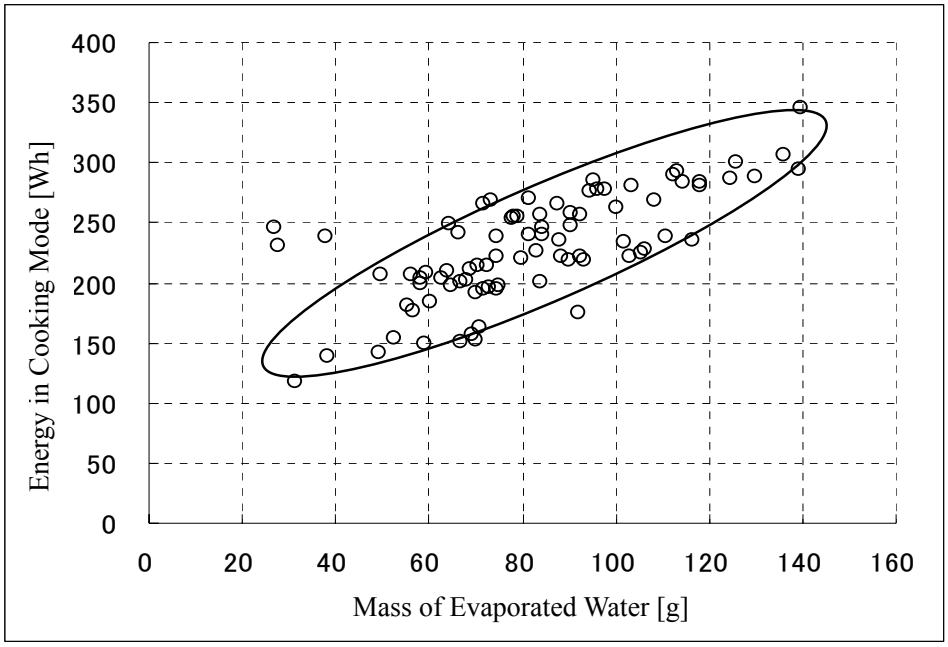


Figure 1: Mass of Evaporated Water - Energy in Cooking Mode

(2) Non-Electromagnetic Induction Heating System Products

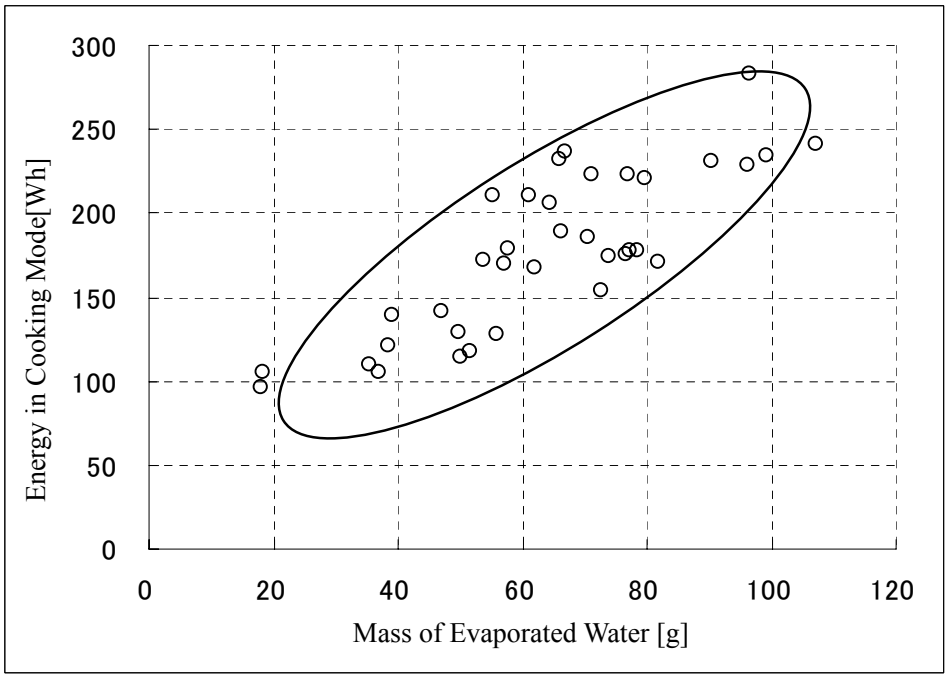


Figure 2: Mass of Evaporated Water - Energy in Cooking Mode

2. Formula for Target Standard Value

(1) Electromagnetic Induction Heating System Products

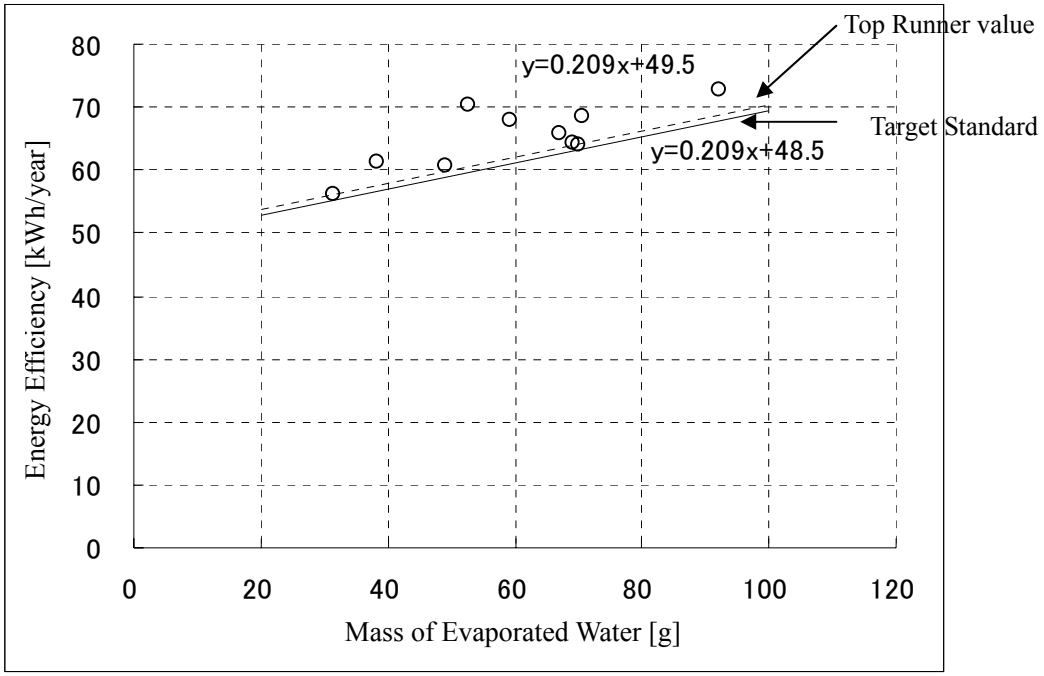


Figure 3: Mass of Evaporated Water - Energy Efficiency (≥ 0.54 to < 0.99 L)

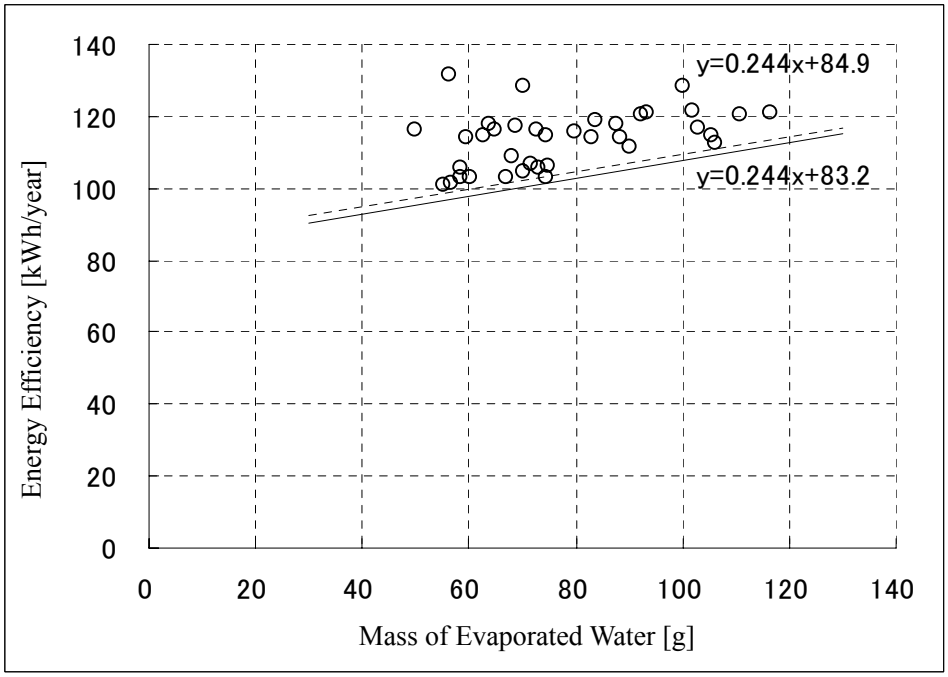


Figure 4: Mass of Evaporated Water - Energy Efficiency (≥ 0.99 to < 1.44 L)

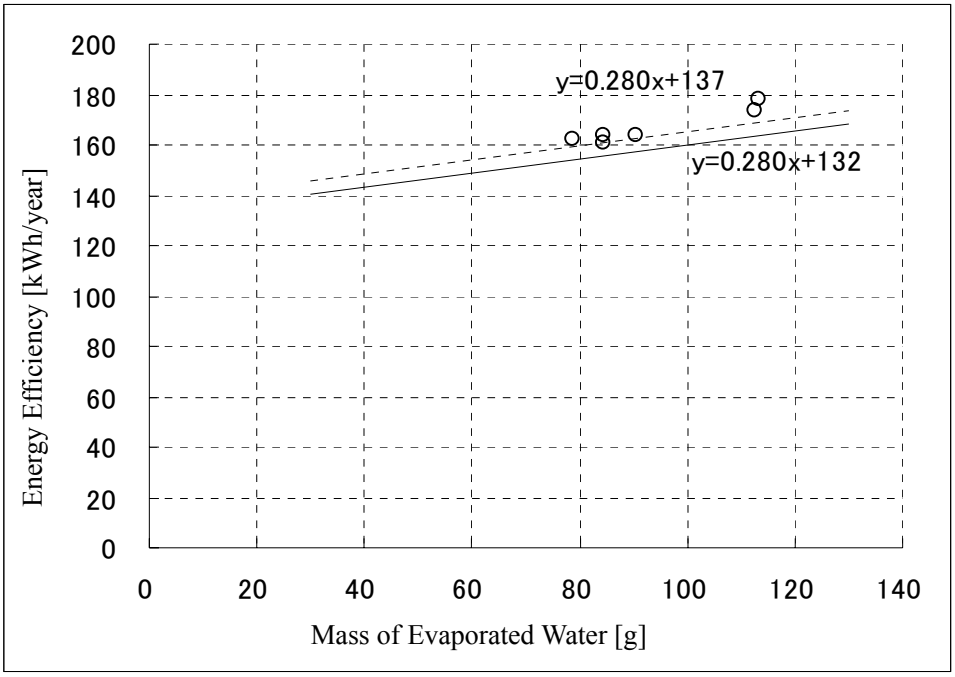


Figure 5: Mass of Evaporated Water - Energy Efficiency (≥ 1.44 to < 1.80 L)

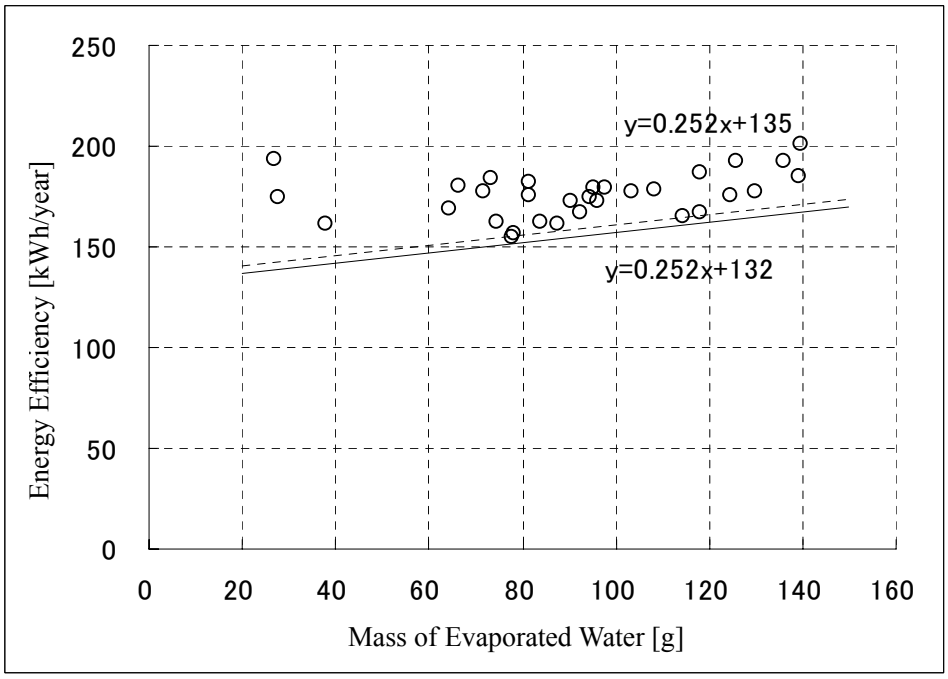


Figure 6: Mass of Evaporated Water - Energy Efficiency (1.80 L and over)

(2) Non-Electromagnetic Induction Heating System Products

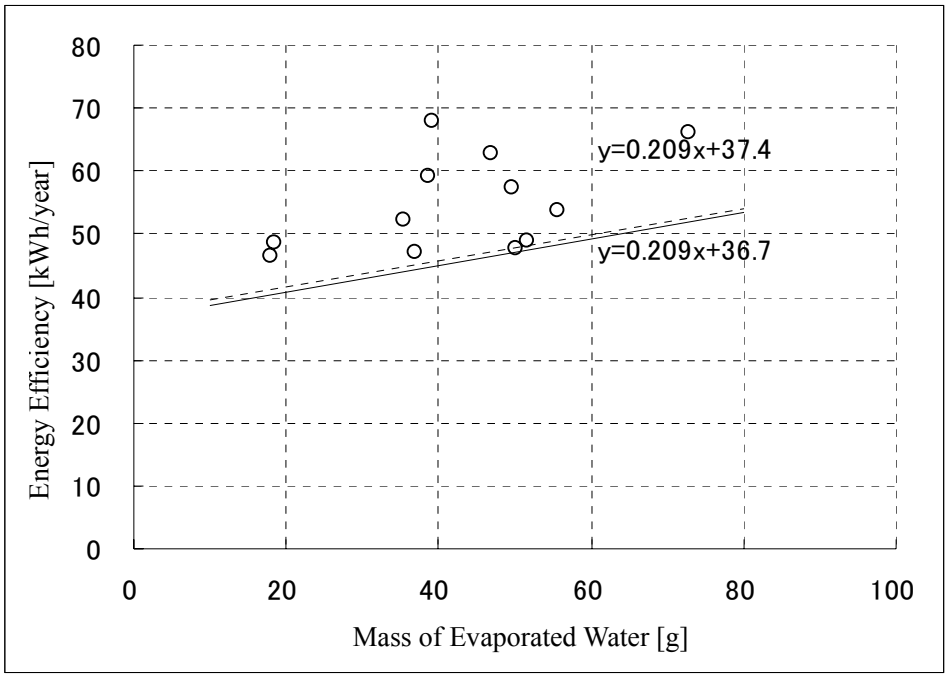


Figure 7: Mass of Evaporated Water - Energy Efficiency (≥ 0.54 to < 0.99 L)

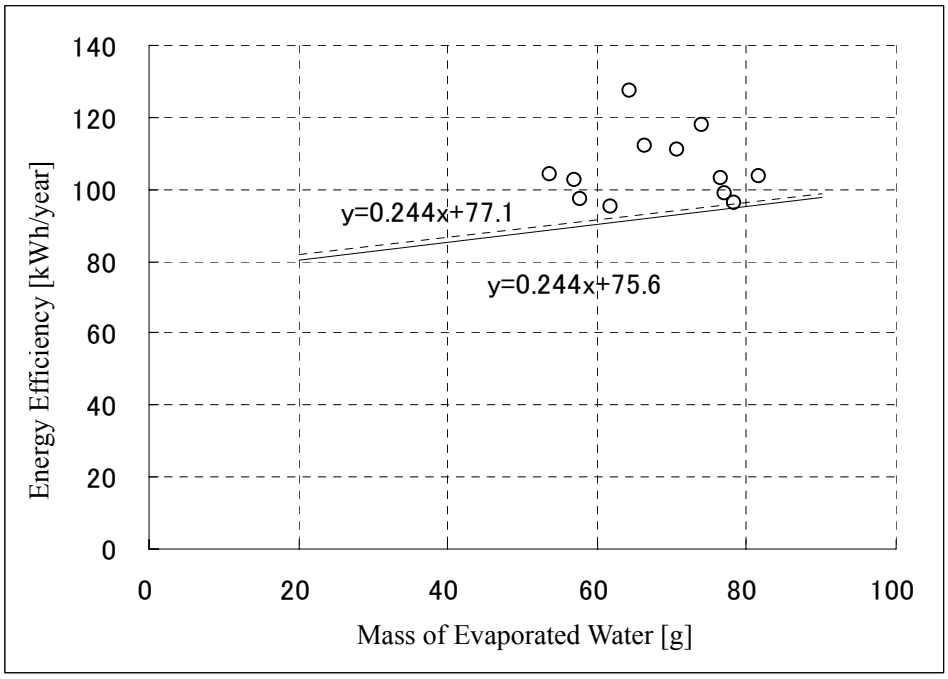


Figure 8: Mass of Evaporated Water - Energy Efficiency (≥ 0.99 to < 1.44 L)

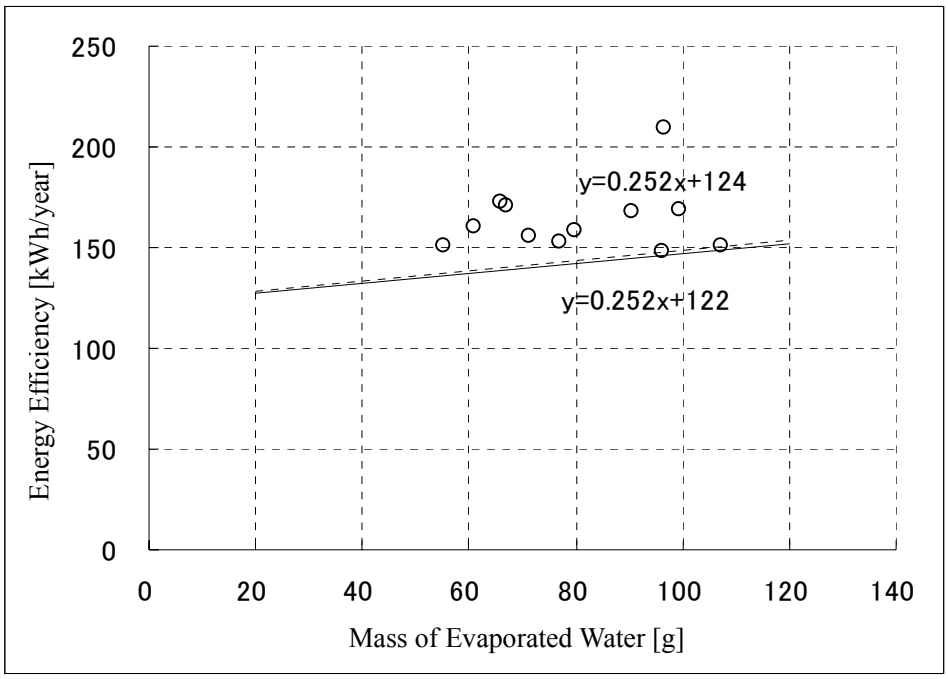


Figure 9: Mass of Evaporated Water - Energy Efficiency (1.80 L and over)

Attachment 5

Energy Efficiency of Electric Rice Cookers and the Measuring Method

I. Basic Approach

"The Electric Rice Cooker Energy Efficiency Study Committee" (Chairman: Tetsuji Oda, a professor of electrical engineering in school of engineering at the University of Tokyo) was established within Energy Conservation Center, Japan. Its study results have been used as the basis for ongoing studies concerning energy efficiency of electric rice cookers and method of measuring the energy efficiency.

An electric rice cooker is a product that consumes electricity in four different modes that include cooking mode, warm mode, timer mode, and standby mode. Therefore, energy efficiency of electric rice cookers is defined as the annual energy consumption of a general household. In addition, the measuring method is specified as follows. First, measure energy in cooking mode, warm mode, timer mode and standby mode separately, and then multiply each of them by the annual number of times that the rice cooker is used. Then, add these values together to yield an overall value. The annual use factor is obtained through "Electric Rice Cooker Actual Use Questionnaire Survey" conducted by Energy Conservation Center, Japan.

Furthermore, the measuring method described above evaluates energy saving performance of electric rice cookers in actual operating conditions. It is not intended to evaluate the taste and finished condition of cooked rice, which relate to cooking performance of rice cookers.

II. Specific Measuring Method

Energy efficiency of electric rice cookers is defined as annual energy consumption [kWh/year], which is calculated through the following formula.

The values for N_A, H_B, H_C, and H_D are shown in Table 1.

$E = \{(A \times NA) + (B \times HB) + (C \times HC) + (D \times HD)\}/1000$

$$E = \{(A \times N_A) + (B \times H_B) + (C \times H_C) + (D \times H_D)\}/1000$$

The variables (E, A, N_A, B, H_B, C, H_C, D and H_D) in the equation express the following values:

E: Energy efficiency [kWh/year]

A: Energy in cooking mode per use [Wh/use]

N_A: Number of use per year [use/year]

B: Energy to keep rice warm per hour [Wh/h]

H_B: Hours of keeping rice warm per year [h/year]

C: Energy in timer mode per hour [Wh/h]

H_c: Hours in timer mode per year [h/year]

D: Energy in standby mode per hour [Wh/h]

H_D: Hours in standby mode per year [h/year]

Table 1. Coefficients of Formula for Energy Efficiency Calculation

Maximum Rice Cooking Capacity [L]	N_A	H_B	H_C	H_D
≥ 0.54 to < 0.99 L	290	920	750	2,760
≥ 0.99 to < 1.44 L	340	1,540	1,190	2,990
≥ 1.44 to < 1.80 L	390	2,180	1,880	1,210
≥ 1.80 L and over	350	2,420	1,000	2,150

1. Energy in cooking mode per use [Wh/use]

Energy in cooking mode per use is defined as energy measured from the start of cooking rice until completion of cooking in a regular course, and it is the average of energy values measured for 3 times. However, in the event that the average value shows ±2.0% and greater deviance from these three measured energy values, additional two measurements are made, and then these 5 measured energy values are averaged.

(1) The mass of milled rice to cook is found in the right column of Table 2 below, and this mass corresponds to the maximum rice cooking capacity of eletric rice cookers that is found in the left column of the table.

Table 2. Maximum Rice Cooking Capacity [L] and Mass of Milled Rice to Cook [g]

Maximum Rice Cooking Capacity [L]	Mass of Milled Rice to Cook [g]
≥ 0.54 to < 0.99 L	300
≥ 0.99 to < 1.44 L	450
1.44L and over	600

(2) The rice specifications are described in the items below.

1) The variety of rice used is “Koshihikari.”

2) The unmilled rice (whole-rice) contains water in a range from 13% and greater to 15 % and less. The measurement of water is carried out in accordance with the standard measuring method that was set out by the Minister of Agriculture, Forestry and Fisheries in the Ministry's Publication No. 332, "Chapter 2 Measuring Method," that was published in 2001 (Year Heisei 13). It is based on the provisions of enforcement regulation for the Agricultural Produce Inspection Law.

3) Rice should be milled at the yield rate of 90±1.5% in mass conversion, and foreign materials and cracked rice kernels should be removed by using a 1.8mm mesh screen.

(3) The mass of water to cook rice is the amount of water that is designated in accordance with the mass of milled rice to cook and specified by the manufacturers in the operation manuals. Further, the mass of water to cook rice includes water adhering to rice through washing.

If a manufacturer doesn't specify the mass of water corresponding to the mass of rice to be cooked, look for an electric rice cooker with similar mass of rice, and the corresponding mass of water is specified by the manufacture. Then, by using them, calculate the ratio of the mass of water to the mass of rice (the ratio of designated adding water: α). The ratio is used in the following formula to determine an appropriate mass of water in question.

$M_W = M_R \times \alpha$

Where:

M_W: Mass of water to cook [g]

M_R: Mass of milled rice to be cooked [g]

α: Ratio of designated added water

(4) Prior to the start of test, temperature of the rice cooker's heating system and the inner pot should be 23±2ºC.

(5) The milled rice is washed three times prior to cooking. Each wash (from pouring water until draining water) should be completed within 20 seconds.

(6) Prior to the test, the water temperature should be 23±1ºC.

(7) If an electric rice cooker has an additional function that can be turned ON/OFF by a user's discretional choice, the function should be turned off during the test. However, essential functions related to the rice cooking such as soaking, steaming, and the like cannot be turned off.

(8) The period from washing rice until the start of cooking rice should be within ten minutes.

2. Energy to keep rice warm per hour [Wh/h]

Energy in warm mode per hour [Wh/h] is defined as energy consumed while an electric rice cooker keeps rice warm for 1 hour. The energy in warm mode is measured as follows.

(1) Following the measurement of energy in cooking mode per use, the electric rice cooker should immediately enter warm mode.

(2) Energy in warm mode per hour is obtained by measuring energy consumed for 12 hours since an electric rice cooker enters warm mode and dividing the measured value by 12.

For electric rice cookers without warm mode, the energy is 0. For electric rice cookers whose warm mode shuts off before the elapse of 12 hours, measure the energy consumed until warm mode shuts off, and divide the measured value by the actual time that elapses in warm mode.

3. Energy in timer mode per hour [Wh/h]

Energy in timer mode per hour [Wh/h] is measured in the following manner. Place an inner pot without rice in an electric rice cooker, close the lid, and set the timer. Once energy consumption settles, measure the energy for 1 hour to determine energy in timer mode per hour.

4. Energy in standby mode per hour [Wh/h]

Energy in standby mode per hour is measured in the following manner. Place an inner pot without rice in an electric rice cooker, close the lid, and leave it in standby mode. Once the energy consumption settles, measure the energy for 1 hour to determine energy in standby mode per hour.

5. The measurement of the energy efficiency of electric rice cookers is carried out under the following conditions.

(1) An ambient air temperature is 23±2ºC.

(2) Under a normal condition, an electric rice cooker is place on the top of a flat wooden board which is 10mm or over thick.

(3) Supply voltage must be 100±1V, and supply frequency must be either 50±0.1Hz or 60±0.1Hz.

(4) The scale should be capable of measuring up to 0.1g, and the size of the relative error for measured values has to be kept within ±0.5%.

(5) As for the watt-hour meter, the size of relative error for measured values should be kept within ±2.0%.
(6) Use either “L” or “M” bar thermometer described in appendix table 2 of JIS B7411 (general use of glass bar thermometers).
(7) Use “Type T, Class 1” thermocouple specified in JIS C1602 (thermocouple).

Attachment 6

Electric Rice Cooker Criteria Standard Subcommittee,
Energy Efficiency Standards Subcommittee of
the Advisory Committee on Energy and Natural Resources
Meeting Background

1st Subcommittee Meeting (August 11, 2004)

- Briefing on Opening of the Electric Rice Cooker Evaluation Standard Subcommittee.
- Discussion of Current Conditions of Electric Rice Cookers.
- Discussion of Results of Study about Measuring Method for Energy Efficiency of Electric Rice Cookers.
- Discussion of the Scope of Target Electric Rice Cookers.

2nd Subcommittee Meeting (September 14, 2004)

- Discussion of the Energy Efficiency of Electric Rice Cookers and of its Measuring Method.

3rd Subcommittee Meeting (December 6, 2004)

- Discussion of Categories of Electric Rice Cookers.
- Discussion of Target Standard Values for Electric Rice Cookers and its Target Fiscal Year.

4th Subcommittee Meeting (January 20, 2005)

- Discussion of the Interim Report.

5th Subcommittee Meeting (March 25, 2005)

- Discussion of the Final Report as well as Comments on the Interim Report

Attachment 7

Electric Rice Cooker Criteria Standard Subcommittee,
Energy Efficiency Standards Subcommittee of the Advisory Committee on Energy and Natural Resources
List of Committee Members

Chairman:	Tetsuji Oda, Professor of Electrical Engineering in School of Engineering at the University of Tokyo.
Members:	Hiroshi Iguchi, Chairman of Home Appliances Cooking Technology Expert Committee at the Japan Electrical Manufacturers' Association.
Hideto Ide,	Professor of Electrical Engineering and Electronics in College of Science and Engineering at Aoyama Gakuin University.
Shoichiro Ozeki,	Senior General Manager of Energy Environment Technology Division at the Energy Conservation Center, Japan.
Akihito Kanai,	General Manager of Consumer Consulting Room at the Japan Consumers' Association.
Yukihiko Sato,	Professor of Electronic Mechanical Systems in Department of Electronics and Mechanical Engineering at Chiba University.
Hiroshi Haruhara,	Executive Director of the Japan Machinery Importers' Association.
Yasuko Nagata,	Consumer Life Consultant at the Nippon Association of Consumer Specialists.
Chiharu Murakoshi,	Director of Jukankyo Research Institute, Inc.

Reference Material: 1

Present Conditions of Electric Rice Cookers

1. Market Trends

1.1 The History of Electric Rice Cookers

- Release of the first domestically produced automatic electric rice cookers in 1955.

The appearance of Japan's first domestically produced automatic electric rice cookers led to dismissal of traditional cooking stoves and to revolution of kitchen. Its appearance in 1955 was tied to the wish to enable anyone to cook rice easily without failure. The birth of electric rice cookers that automatically cook rice only with flipping a switch truly revolutionized kitchens and dining tables.

Following this, an electronic jar rice cooker that is combined an electronic jar (appliance for keeping warm) with an electric rice cooker was released in 1972. This was possible to cook rice and to keep it warm, and the bother of transferring cooked rice from a cooker to a jar was eliminated. (Note: This type of rice cooker is currently termed a mechanical rice cooker.)

- Release of the first microcomputer jar rice cooker in 1979.

Since 1979 when electronic technology has progressed, manufacturers released electronic jar rice cookers equipped with microcomputers. With these rice cookers, there was no need to worry about time to soak rice after wash, and the heating level became adjustable according to the volume of rice.

As these types of control technologies advanced, rice cookers with memory timers that can be easily set a fixed time for cooking were appeared in the market. Additionally, in response to users' needs for "greater taste of rice", a new rice cooker was developed with a mechanism to control heat, simulating the Japanese folk song that describes tips of cooking perfect rice. The song goes, "Start with low heat, and turn up the flame in the middle. When the

rice starts making a dry noise, turn off the heat, and keep the lid on to rest it even if your baby cries for rice."

- Release of the first IH jar rice cooker in 1988.

In 1988, the first IH jar rice cooker was released. Instead of the heat system previously used, these rice cookers employed an electromagnetic induction heating (IH) system, and it generates greater heating power. The IH jar electric rice cooker was also designed with the intention of improving the taste of cooked rice.

Note: Table 1-1 shows the relationship between the name of electric rice cooker, the control methods, and the heating system.

Table 1-1 The Relationship between the Name of the Electric Rice Cooker, the Control Method, and the Heating System

<table>
<tr><th>Name</th><th>Mechanical Rice Cookers</th><th>Microcomputer Rice Cookers</th><th>IH Rice Cookers</th></tr>
<tr><td>Control Method</td><td><u>Control by a mechanical switch</u>
The rice cooker is powered by a steady electric current. A built-in thermal sensor switch located under the rice cooker pot detects when the water runs out, and a mechanical switch cuts off the electricity.</td><td colspan="2"><u>Control by Microcomputer</u>
A microcomputer receives information from semiconductor thermal sensors located under the pot and inside the lid of a rice cooker and uses this information to control the volume of current.</td></tr>
<tr><td>Heating System</td><td colspan="2"><u>Direct Heating System</u>
The rice cooker's pot is heated by thermal conduction of the heater.</td><td><u>Electromagnetic Induction Heating System</u>
Coils generate an eddy current in a rice cooker pot, and the pot heat itself by this electric resistance.</td></tr>
</table>

1.2 Number of Units Shipped Domestically

Since the introduction of the first domestically produced automatic electric rice cookers for general household use in 1955, electric rice cookers have spread as appliances which lighten household work. Since the second half of the 1980s, the annual domestic shipment of electric rice cookers has hovered around 6 million.

Table 1-2 and Figure 1-1 show changes of the following figures since 1990: the number of rice cookers shipped domestically, overall domestic production including export units, the number of units produced overseas (by Japanese affiliates in overseas), and the number of units imported from overseas. As shown in Figure 1-1, the number of units shipped domestically hovers around 6 million, but the whole data also shows the shift of production centers from Japan to overseas. In 2003, the overseas production of electric rice cookers exceeded the domestic production. In addition to this, considering that the number of units produced overseas exceeds the number of units being imported, we can infer that many of the imported units are manufactured by Japanese companies in overseas and sold in Japan as reverse imports.

Table 1-2 Trends of Domestic Shipment, Domestic and Overseas Production, and Import of Electric Rice Cookers

Unit: Thousands

	1. Number of Domestic Shipments (JEMA Self-Statistics)	2. Number of Domestic Production (METI Statistical Survey of Production Trends)	3. Number of Overseas Production (JEMA Self-Statistics)	4.Number of Imports (Ministry of Finance Customs Statistics)
FY 1990	6,219	7,542	1,442	—
FY 1991	6,318	7,053	1,732	—
FY 1992	6,179	6,687	2,932	—
FY 1993	6,352	7,022	3,093	—
FY 1994	6,622	7,663	2,745	—
FY 1995	6,256	6,839	3,096	—
FY 1996	6,851	6,437	3,288	—
FY 1997	6,431	6,211	3,107	628
FY 1998	6,150	5,814	2,704	1,109
FY 1999	6,104	5,464	3,280	1,670
FY 2000	6,191	5,406	4,437	2,275
FY 2001	6,102	5,019	4,571	2,406
FY 2002	6,244	4,943	3,675	2,876
FY 2003	6,271	4,253	5,067	2,949

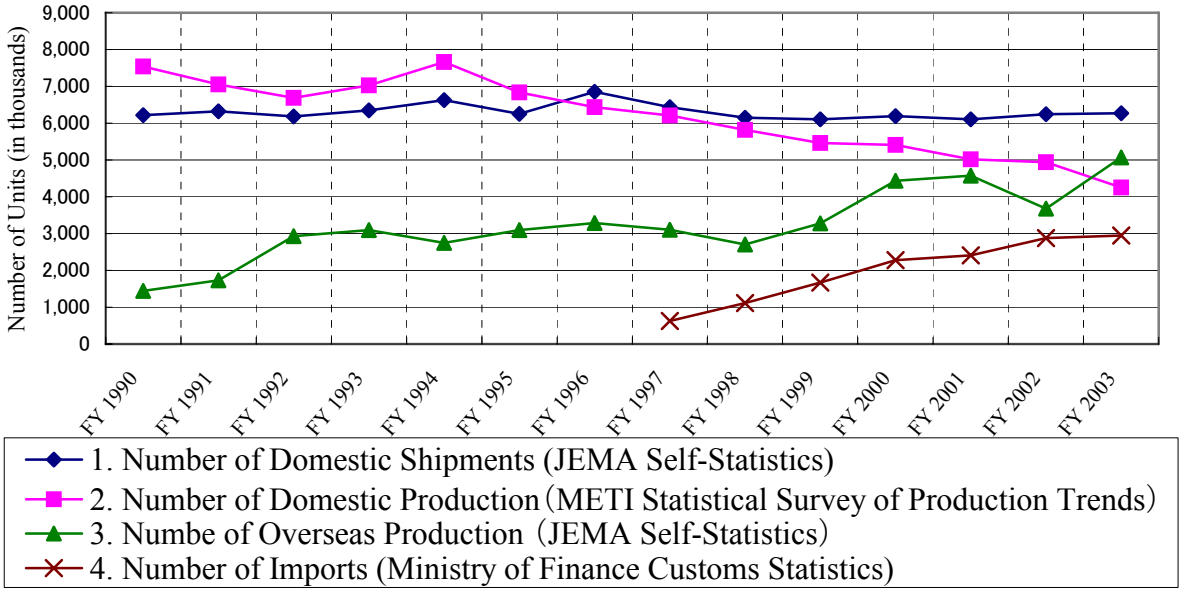


Figure 1-1 Trends of Domestic Shipment, Domestic and Overseas Production, and Import of Electric Rice Cookers

Sources:

Domestic production statistics: METI Statistical Survey of Production Trends

Import statistics: Ministry of Finance Customs Statistics

Domestic shipment statistics and Overseas production statistics: Japan Electrical Manufacturers' Association

1.3 Domestic Shipment of Electric Rice Cookers by Type

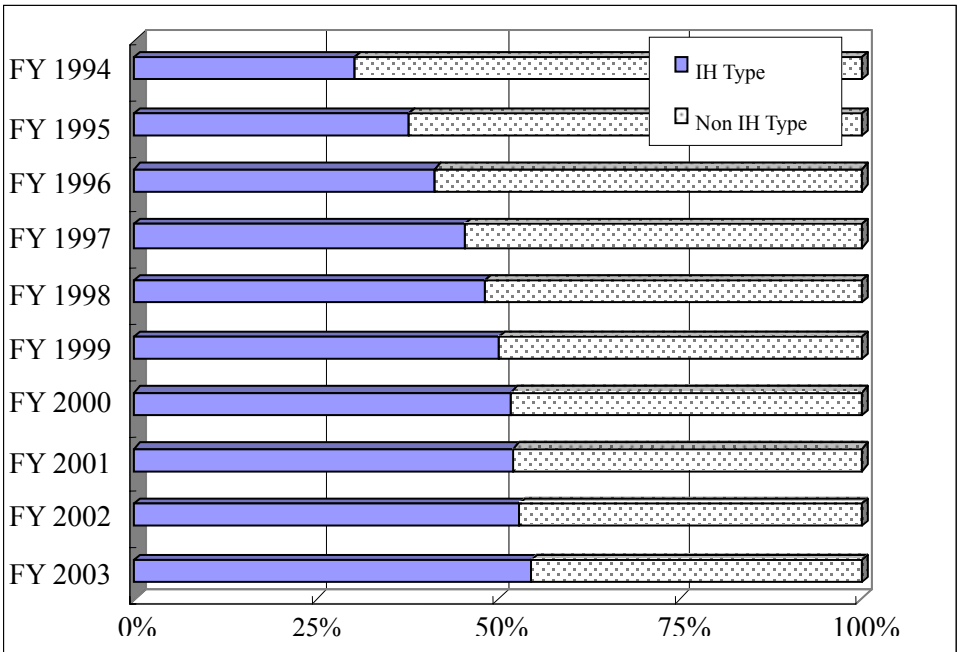
Table 1-3 is the number of IH electric rice cookers and non-IH electric rice cookers shipped domestically. In addition, Figure 1-2 shows the ratio of each type of electric rice cookers to the number of units shipped domestically. IH electric rice cookers were introduced in 1988, and it accounted for roughly half of all rice cookers shipped domestically in 1999. This increasing trend continues after 2000. Table 1-4 shows the ratio of the number of domestic shipments of electric rice cookers without microcomputers (mechanical rice cookers) to the total number of domestic shipments of electric rice cookers. With the appearance of electric rice cookers with microcomputers and IH electric rice cookers, the number of mechanical rice cookers shipped has been

declining steadily year by year, and it accounted for below 1 percent of the total number of domestic shipments of electric rice cookers in fiscal year 2003.

Table 1-3 Domestic Shipments of IH Electric Rice Cookers and Non-IH Electric Rice Cookers

Unit: Thousands

Fiscal Year	IH Type	Non-IH Type	Total
1994	2,007	4,615	6,622
1995	2,365	3,890	6,256
1996	2,831	4,020	6,851
1997	2,915	3,516	6,431
1998	2,959	3,191	6,150
1999	3,056	3,049	6,104
2000	3,201	2,990	6,191
2001	3,184	2,918	6,102
2002	3,297	2,948	6,244
2003	3,424	2,847	6,271



Figures 1-2: Percentage by Type of Electric Rice Cooker Units Shipped Domestically

Source: Japan Electrical Manufacturers' Association

Table 1-4 The Ratio of Domestic Shipments of Mechanical Rice Cookers to the Total Number of Domestic Shipments of Electric Rice Cookers

Fiscal Year	Total Number of Domestic Shipments of Electric Rice Cookers (in thousands)	Number of Domestic Shipments of Mechanical Rice Cookers (in thousands)	Percentage of Domestic Shipments of Mechanical Rice Cookers (%)
1996	6,851	365	5.3%
1997	6,431	274	4.3%
1998	6,150	166	2.7%
1999	6,104	144	2.4%
2000	6,191	137	2.2%
2001	6,102	87	1.4%
2002	6,244	79	1.3%
2003	6,271	46	0.7%

Source: Japan Electrical Manufacturers' Association

1.4 Domestic Shipments of Electric Rice Cookers by Cooking Capacity

Table 1.5 shows the number of domestic shipments of electric rice cookers by cooking capacity. The ratio of it to the total number of domestic shipment is presented in Figure 1-3. The number of domestic shipments of electric rice cookers with smaller capacity (< 0.99 L) does not show much change. At the same time, electric rice cookers with medium capacity (≥ 0.99 to < 1.8 L) are on the increase and now account for nearly 60 percent of the total domestic shipments of electric rice cookers.

Table 1.5 Number of Domestic Shipments of Electric Rice Cookers by Cooking Capacity

Unit: Thousands

Fiscal Year	< 0.99 L	≥ 0.99 to < 1.8 L	1.8L and over	Total Number of Electric Rice Cookers
1990	998	2,940	2,281	6,219
1991	1,052	3,001	2,265	6,318
1992	993	2,957	2,229	6,179
1993	957	3,121	2,274	6,352
1994	1,009	3,342	2,271	6,622
1995	998	3,161	2,097	6,256
1996	1,160	3,421	2,271	6,851
1997	1,132	3,213	2,086	6,431
1998	1,172	3,109	1,868	6,150
1999	1,162	3,148	1,794	6,104
2000	1,085	3,294	1,811	6,191
2001	1,065	3,304	1,733	6,102
2002	1,163	3,438	1,644	6,244
2003	1,129	3,563	1,579	6,271

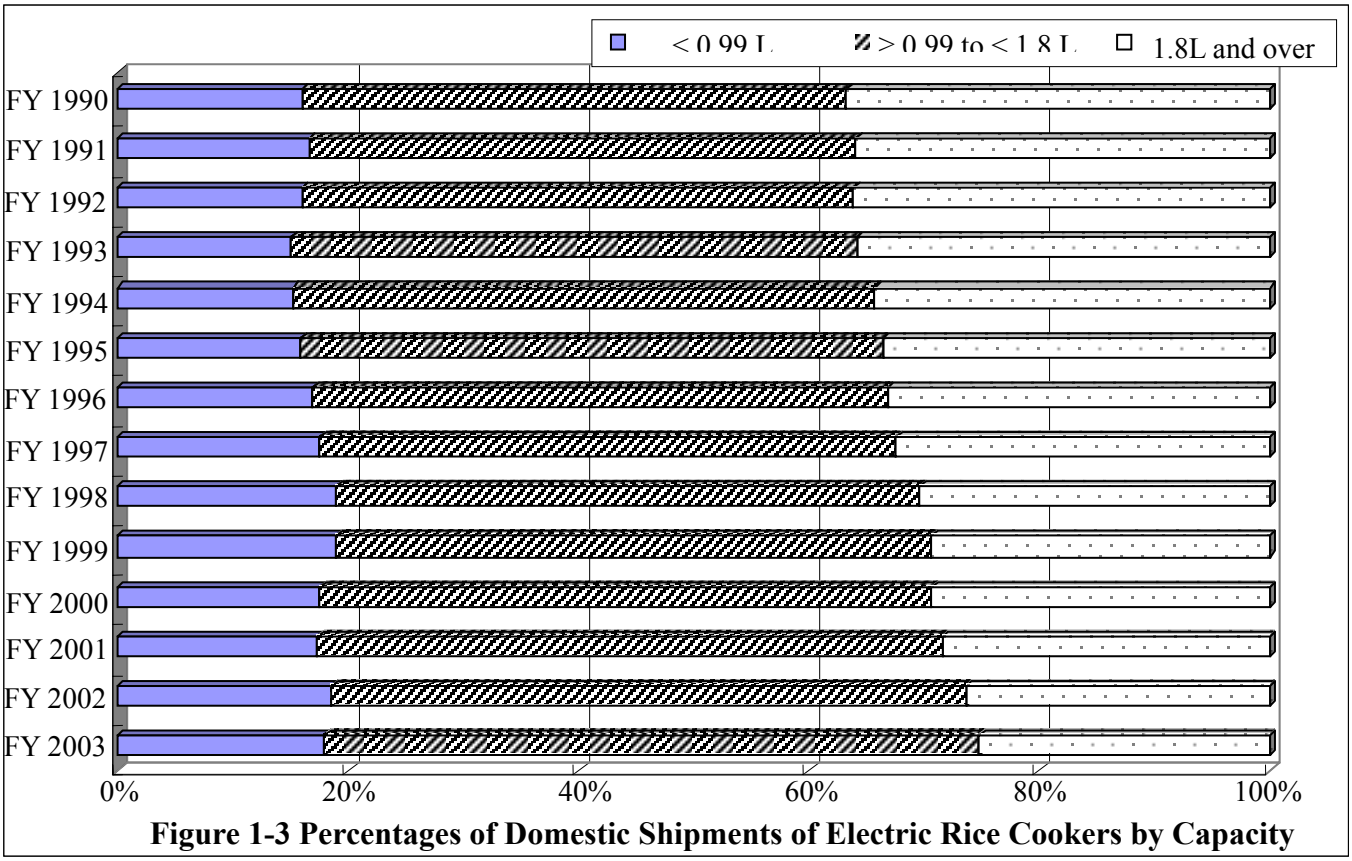


Figure 1-3 Percentages of Domestic Shipments of Electric Rice Cookers by Capacity

Source: Japan Electrical Manufacturers' Association

1.5 Domestic Shipments of Electric Rice Cookers by Cooking Capacity and by Type

Table 1.5 shows the number of domestic shipments of electric rice cookers by cooking capacity and by type. In addition, Figure 1-4 shows the proportion of electric rice cookers by capacity and by type in fiscal year 2003. In recent years, the IH electric rice cookers with medium capacity (≥ 0.99 to < 1.8 L) account for approximately one-third of the total domestic shipments of electric rice cookers.

Furthermore, Figure 1-5 shows the proportion of IH electric rice cookers by capacity to the total in fiscal year 2003. With respect to electric rice cookers with smaller capacity (< 0.99 L), the proportion of IH electric rice cookers in this category is smaller compared to their proportions in other categories (electric rice cookers with medium and larger capacities).

Table 1-5 Number of Domestic Shipments of Electric Rice Cookers by Cooking Capacity and by Type

Unit: Thousands

Fiscal Year	IH Type			Non-IH Type		
	< 0.99 L	≥ 0.99 to < 1.8 L	≥ 1.8L	< 0.99 L	≥ 0.99 to < 1.8 L	≥ 1.8L
1999	188	1,800	1,068	974	1,348	726
2000	179	1,921	1,102	906	1,374	710
2001	196	1,938	1,051	870	1,366	682
2002	184	2,097	1,016	979	1,341	628
2003	197	2,241	986	932	1,322	593

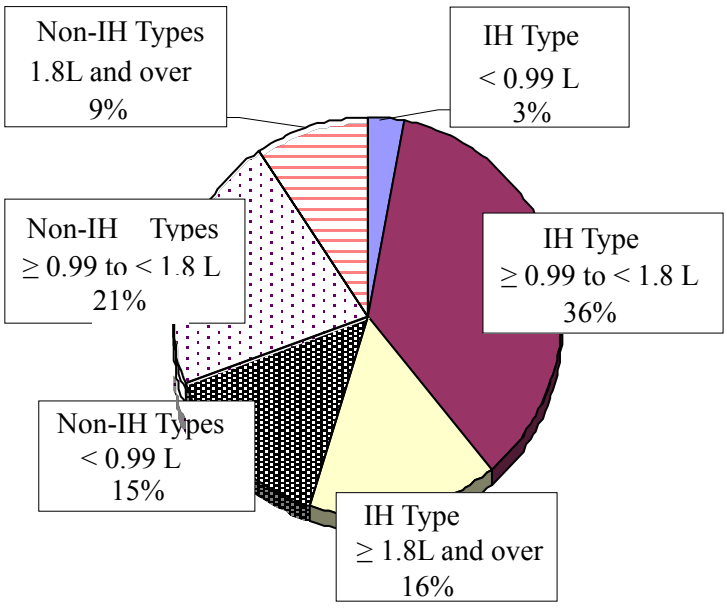


Figure 1-4 Proportion of Electric Rice Cookers Shipped in Fiscal 2003 by Capacity and by Type

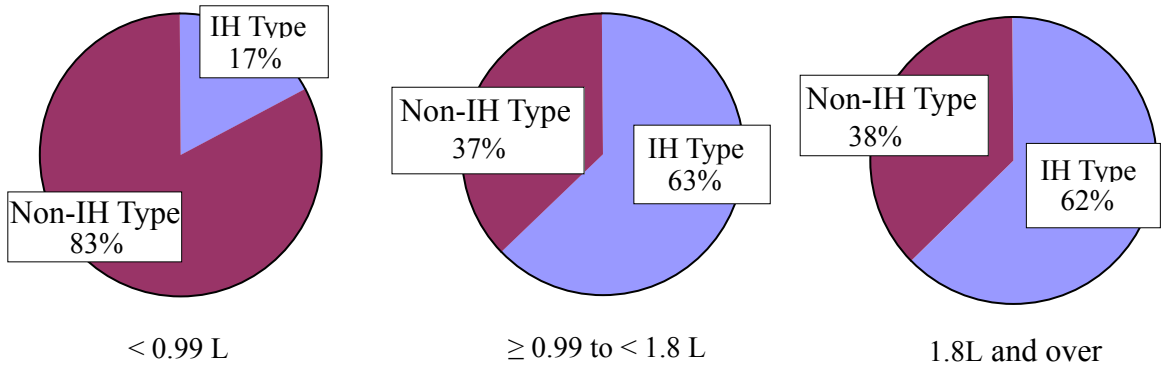


Figure 1-5 Proportion of IH and Non-IH Rice Cookers Shipped in Fiscal Year 2003 for Each Capacity

1.6 Major Domestic Manufacturers and Retailers of Electric Rice Cookers

Major domestic manufacturers and retailers of electric rice cookers are listed below (in random order).

Sanyo Electric Co. Ltd., Sharp Corporation, ZOJIRUSHI CORPORATION, Tiger Corporation, Toshiba Corporation, Hitachi Home and Life Solutions Inc., Matsushita Electric Industrial Co. Ltd., Mitsubishi Electric Corporation.

One distinction about electric rice cookers is, compared to other electric appliances, that not many electric rice cookers produced by overseas manufacturers are imported to Japan. There are a couple of reasons for this. The first has to do with the differences in kinds of rice preferred. Nonglutinous rice is the most common in Japan, while long-grain rice is generally preferred in overseas. Because of this, it is suspected that the cooking preparations are significantly different for between these two kinds of rice.

2. Consumers' Request for Electric Rice Cookers

2.1 What do Consumers Expect from Electric Rice Cookers?

A manufacturer conducted a survey on "What Consumers Expect from Electric

Rice Cookers at the Time of Purchase" to consumers between 20 and 50 years of age, and the results are shown in Table 2-1.

Table 2-1 What Consumers Expect from Electric Rice Cookers at the Time of Purchase (Number of samples: 599)

Deliciousness of cooked rice	82.5
Deliciousness of cooked rice in warm mode	62.3
Price	57.9
Energy efficiency	47.7
Ease of maintenance	44.2
Ease of operation	42.7
Size	25.2
Time required to cook rice	22.5
Design	18.2
Consideration for recycling	12.9
Weight	12.0
Ease of carry	11.0

From these survey results, we can see that deliciousness of cooked rice is more important to consumers than price of electric rice cookers. In addition, energy efficiency is also an important concern for consumers. Based on these, manufacturers are working to improve deliciousness of cooked rice as well as energy efficiency of their products.

However, there is no objective standard to evaluate deliciousness of cooked rice. Therefore, manufacturers have established their own standards and use them in an effort to improve the relative deliciousness of cooked rice.

In other words, issues like the volume of heat and control methods for heating employed in electric rice cookers are set based on each manufacturer's accumulated know-how. They are also decided by each manufacturer's policy on what type of cooked rice to provide for consumers, which is influenced by the manufacturer's own empirical rules. It is possible to say that this also affects the difference in the amount of adding water that manufacturers recommend.

In addition, manufacturers are working on energy efficiency of electric rice cookers, and this is discussed in the following section.

3. Energy Saving of Electric Rice Cookers---Efforts up to Now

3.1 Energy Saving in Warm Mode

As shown in Table 3-1, the condition of rice in warm mode varies greatly depending on temperature of warm mode.

Table 3-1 Temperature of Warm Mode and Condition of Rice

Temperature of Warm Mode	Condition of Rice
Around 70℃	Rice dries, hardens, and turns yellow.
Below 60℃	Rice rots due to bacterial propagation.

Because of this, in order to guarantee the safety of cooked rice and to prevent from rotting, energy efficiency was neglected. Therefore, in past electrical rice cookers, the rice was kept warm at around 70℃.

In recent years, "low temperature warming method", with which the temperature of warm mode normally set at around 60℃ is risen to over 70℃ every several hours to prevent bacterial propagation, is developed. It allows manufacturers take energy saving into consideration (Reference: Figure 3-2).

Table 3-2 shows electric consumption of IH electric rice cookers (1.0L) in warm mode. It is the average of the values presented in catalogues of all manufacturers of electric rice cookers in 1993 and 2004. It is possible to confirm that the current electric consumption in warm mode is approximately 12 % less than the one in 1993.

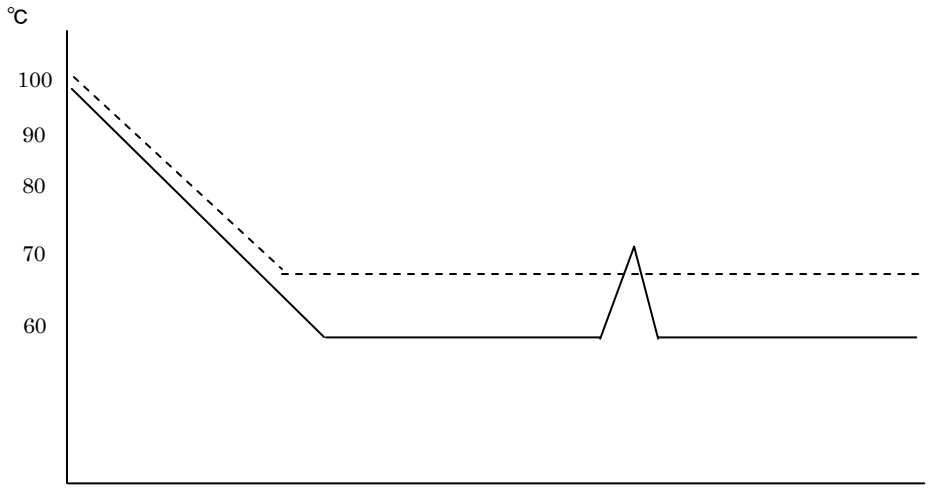


Figure 3-2 Principle of Operation of Low Temperature Warming Method

Table 3-2 The Average Value of Electric Consumption in Warm Mode for Electric Rice Cookers (IH Type, 1.0L)

Fiscal Year	Electric Consumption in Warm Mode (W)
1993	31.0
2004	27.3

Note: The average value is calculated from the values listed in the catalogs of all manufacturers. The measurement method is based on the Japan Electrical Manufacturers' Association's independent standard HD-0057.

3.2 Energy Saving in Standby Mode

From the standpoint of energy saving, power consumption of electric appliances in standby mode cannot be ignored. The Japan Electronics and Information Technology Industries Association (JEITA), the Japan Refrigeration and Air Conditioning Industry Association (JRAIA), and the Japan Electrical Manufacturers' Association (JEMA) announced, in their joint names, an approach to reduce power consumption in standby mode. They self-declared that power consumption in standby mode should become as close as zero for products without timer and 1W or below for products with timer by the end of fiscal 2003 (for air conditioners by the end of September 2004). In order to preserve this declaration, all manufacturers made improvement in control circuits of their products and achieved this target 100% for electric rice cookers.

Table 3-3 Progress of Power Consumption in Standby Mode

Power Consumption in Standby Mode in fiscal 2000[*1]	Power Consumption in Standby Mode in April, fiscal 2004[*2]
1.7 W	0.74W

Source: *1 Survey on Power Consumption in Standby Mode (fiscal 200), by Energy Conservation Center, Japan.

*2 The Japan Electrical Manufacturers' Association

3.3 Transition from Heater Type Electric Rice Cookers to IH Type (In 2004, IH electric rice cookers account for over half of the market.)

In the past, compared with gas rice cookers, electric rice cookers were considered to be inferior in terms of taste of cooked rice because of their weak heating power, despite the fact that they are convenient for timer and warming modes.

With this consideration, IH electric rice cooker was developed in 1988. Because in the IH type the pot is heated directly through electromagnetic induction, heating efficiency is higher than the heater type in which the pot is heated through thermal conduction. However, in order to challenge the heating power of gas rice cookers, the rated power of IH electric rice cookers is increased for better taste of cooked rice. As a result, power consumption of IH electric rice cookers become

greater than the heater types'.

There is a large difference between prices of the heater types and the IH types (Reference: Table 3-4), but we can conclude from the trend of increasing popularity of the IH type that consumers place a greater priority on the deliciousness of cooked rice over the cost.

Table 3-4 Average Retail Price of IH and Heater Type Rice Cookers

Type	IH Type		Heater Type	
Capacity	1.0L	1.8L	1.0L	1.8L
Retail Price Range	Approx.31,300 yen	Approx.33,500 yen	Approx.8,700 yen	Approx.10,500 yen

Note: Average retail price at a certain volume outlet: It is from an Internet survey conducted on August 2, 2004.

4. Future Efforts and Issues Related to Energy Saving of Electric Rice Cookers

Cooking rice is to prepare rice to serve with other food by adding heat to raw rice and water to induce chemical changes in the starch. It requires a fixed amount of heat energy, and a decrease in this heat energy may cause the unevenness in cooked rice and the lowering taste.

With today's technology, it is difficult to obtain a dramatic improvement in heat efficiency of heaters, then again, it is easy to achieve energy saving if the deliciousness of cooked rice is sacrificed. Therefore, without being influenced from these kinds of products, it is necessary to establish a category in which rice cookers that are capable of cooking delicious rice are not regulated.

Example: If the proportion of adding water is decreased, the amount of evaporated water and the power consumption also decreases. However, the rice will be cooked hard or undercooked in some cases. If these products are set as Top Runner products, then it is possible to imagine that only electric rice cookers that cook rice hard will remain in the market, because manufacturers cannot set larger (existing) proportion of adding water than these Top Runner products'. In order to prevent such situation, it is necessary to consider establishing separate categories for products whose proportion of adding water falls outside of the current distribution of the proportion of adding water. While establishing efficient categories, manufactures are expected to develop further advanced technologies to achieve both deliciousness of cooked rice and energy saving.