The Japan Rice-Yield Contest

K. YASUDA
Cultural Project Department, Asahi Shimbun

From the year 1949 on, the Asahi Shimbun, in cooperation with the Ministry of Agriculture and Forestry, the Central Union of Agricultural Cooperatives and 46 prefectural governments, has held an annual contest entitled the Japan Rice-yield Contest. Farmers compete in the contest to obtain the highest rice-yields per hectare. Details of the contest, and a discussion of the methods used and results obtained by the national prizewinners for the past 18 years, are given below.

Details of the contest

Any rice farmer in Japan may take part in the contest. Each participant designates ten ares out of his total area of rice-fields under cultivation as his 'contest area', and the yields from this area is judged against those obtained by other contestants. Judging is carried out by an organization based on a central judging committee at the national level and local judging committees at a prefectural level. Judges are also appointed for the divisions known as 'gun,' and the municipalities within the prefectures. Preliminary judging is carried out, thus, at a 'gun' or municipal level. The yields of each contest area are measured by the observation of standing crops, the counting of grains, and other methods. Several contestants attaining high yields on their contest areas are selected in each prefecture at this preliminary judging. Next, the prefectural judging committees carry out prescribed sampling tests among these prefectural winners to select the 'Number One' for the prefecture. From among these prefectural winners, again, those whose yields are above a certain figure compete in the national contest judged by the central judging committee. The total harvest of each contest area is gathered and exact yields are calculated. From the results the nation's 'Number One' rice farmer is chosen.

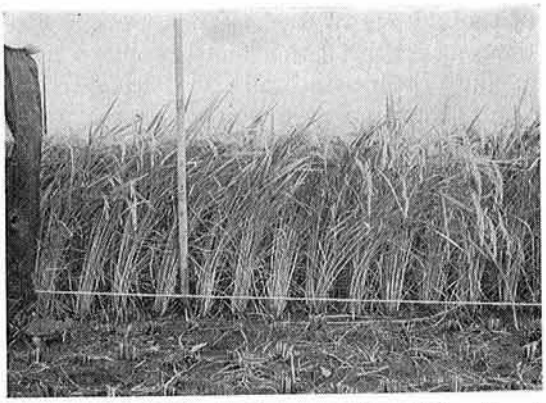
Yields in the contest are expressed in terms of the weight of brown rice meeting the national inspection standard specifications for 4th-grade or higher grade rice and having a moisture content of 14 percent. For reference, the table (p. p. 33–34) also shows the weight of paddy with the same moisture content.

The methods used and results obtained by the national prizewinners, over an 18-year period

All the national prizewinners over the period have obtained extermely high yields. Average yields were 9.1 tons per hectare (11.08 tons in terms of paddy), the highest being 10.52 tons (12.48 in terms of paddy) attained by the 1960 winner, Mr. Kudo of Akita Prefecture. For reference, the 1965 national average rice-yield was 3.90 tons (brown rice) per hectare.

The cultivation techniques leading to these high yields are subsequently made known to all farmers in Japan to aid their own methods. The contestants also provide experts in various fields of agronomy with actual subjects for analytical studies aimed at clarifying the principles of high-yield cultivation. In these ways, contributions have been made to the advance of rice-growing techniques in Japan.

Although the methods of the 18 national prizewinners are not necessarily all the same, a professor of Tokyo University, Dr. Togari, analysing the methods of the 14 national prizewinners up to 1962, found four common features: 1. Deep tillage. 2. Heavy use of



The crop of Mr. A. Watanabe, the 1966 national prizewinner.
Photographed by Mr. T. Hirano, Tōhoku Agricultural Experiment Station.

farmyard manure or compost. 3. Efficient drainage. 4. 'Temporary drainage' and 'intermittent irrigation'. He considered it highly significant that these four features had been shown by the contest to be the basis of high-yield rice-cultivation techniques.

Methods used by the national prizewinners are summarised below. (Table 1.)

Nursery

There is an old Japanese saying 'A good seedling is half the crop'. All the 18 national prizewinners follow the rule implied by this saying. Great care is taken in the raising of seedlings. With Mr. Tarumi, the 1953 winner, for example, the preparation of the nursery field begins well ahead of season, and includes manuring with well-rotted compost. Infinite care is exercised in making the seed-beds. First a compost of rice-hulls is applied, and then the ground is ploughed several times, until all lumps of clay, etc. are clashed, and the soil is smooth and even. Next the field is irrigated and the seed-beds and irrigation channels between them are formed; the process of flooding the fields and allowing them to dry out again several times during this procedure produces nursery beds all on the same level, whose surfaces are in a uniform, colloidal state. Now the seeds are sown evenly in these beds and covered with fine, uniform soil mixed with fertilizers. At first after sowing, water is introduced only into the surrounding irrigation channels, but after about two weeks the water is allowed to rise to a level about 1 cm. above the bed surface . . . . . The seedlings raised by Mr. Tarumi in this manner were entirely submerged under muddy water for several days as a result of two floods occurring in the year in question, but they survived to win the prize.

Since 1954 various different types of nursery—protected nurseries covered with oiled paper, vinyl or the like—have also been in use, and seedlings have even been raised in incubators. But it seems that these types of nursery are not practical for use in the tropical zone, so no description of the methods involved is given here.

Soil improvement

As pointed out by Dr. Togari, a heavy use of manure or compost, coupled with deep tillage and efficient drainage, creates the best soil conditions for high yields. Data as to the 18 national prizewinners shows that the average amount of farmyard manure or compost used is 17 tons per hectare, and the average deepth of tillage is 19 cm. These figures are considerably higher than the national averages.

About half the winners depend heavily on soil dressing to provide various crop-nutrients and improve the quality of the soil. Considerable amounts of iron-rich soil, silica, and coal combustion by-products (including boron, etc.) have been used in recent years.

Fertilization

Besides farmyard manure and compost various chemical fertilizers are applied. The prize-winning farmers used far heavier amounts of these fertilizer than the average rice-grower. Their average outlay of fertilizer nutrients per hectare was 231 kg. of nitrogen (N), 170 kg. of phosphate (P_2O_5), and 241 kg. of potash (K_2O). The outstandingly heavy use of potash is worthy of note. Phosphate is also very heavily applied.

Of late a change has appeared in fertilization methods. Rather than a heavy basic dressing and light top dressings, the winners for the last two years place the emphasis on the top-dressings. By varying the amounts of each top-dressing from time to time, they attempt to control leaf emergence, tillering, number of grains, and the shape and colour of the leaves, so that the plant may grow to the most desirable shape from the point of view of yield potential.

'Intermittent irrigation' and 'Temporary drainage'

Outstanding among the techniques developed by farmers participating in the contest, and now in wide general use is a method of water control now known as 'intermittent irrigation'. Instead of being left submerged under water successively, the field is drained out for a day or so at intervals of two or three days. The term 'temporary drainage' means the prolongation of the period of drainage for several days so that the soil dries out well. Both methods are said to be useful in intermittently introducing needed oxygen into the soil and in eliminating harmful substances (e.g. organic acids and methane) generated in the soil. The method was first introduced by the 1951 winner, Mr. Doi, and was subsequently adopted and modified by the 1954 and 1955 winners, Mr. Kawahara and Mr. Zyoraku. Their success led to the general recognition of the efficacy of the methods. From that time on, all the national prizewinners have adopted them. Naturally, an efficient irrigation system is a prerequisite for the adoption of these methods, as the flow of water must be capable of adjustment and regulation.

Labour requirements

It is generally believed that high yields entail an uneconomically heavy labour input. The labour input of the 18 winners, however, is surprisingly low. Although their labour input per hectare is somewhat above the national average, in terms of ratio of labour input to yield, their average input of labour to produce one ton of brown rice is only about 21—24 man-days, or about half the national average, which was 40 man-days in 1965. Moreover further reduction is apparent, in recent years the national winners' labour input for 1 ton of brown rice has decrined to about 18—19 man-days.

Furthermore, there is room for further improvement in methods, so that the general principles for high-yield cultivation formulated on the basis of the contest-winners' techniques can be applied with even lower labour input. This would seem a suitable area for research. The aim for the future is the development of ever improved techniques making possible higher and higher yields, through the ingenuity of the nation's farmers, leading to further yield records.

Table 1. The methods used by the eighteen national

Year	The winners of first prize	Prefecture	Yields (ton/hectare)		Soil characters *	Depth of plowing (cm)	Well-or ill-drainage	Soil-dressing
			Broun rice	Paddy				
'49	A. Maesawa	Nagano	7.66	9.50	S. L.	18	good	
50	Z. Nishimura	Kagawa	7.77	9.97	L.	18	Somewhat poor	
51	T. Doi	Toyama	8.58	10.35	C.L.	20	Somewhat poor	
52	Y. Ōkawa	Kagawa	9.20	11.22	C.L.	18	good	
53	I. Tarumi	Fukuoka	8.75	10.66	C·	11	good	Mud (a little)
54	S. Kawahara	Toyama	9.94	12.33	C.L.	18	good	
55	K. Zyōraku	Toyama	10.15	12.32	L.	15	good	
56	K. Momose	Nagano	8.69	10.46	S.L.	20	good	Mountain Soils (220 t. in 4 yrs.)
57	E. Fuzimori	Nagano	8.56	10.59	C.L.	17	Somewhat poor	
58	N. Kitahara	Nagano	10.24	12.36	C.L.	16	good	Mountain Soils (380 t. in 5 yrs.)
59	K. Katō	Akita	9.59	11.39	L.	21	good	Mountain Soils etc. (1800 t. in 10 yrs.)
60	Y. Kudō	Akita	10.52	12.48	C.L.	18	good	Mountain Soils (300 t. in 8 yrs.)
61	M. Koike	Nagano	9.75	11.96	Si. L.	33	good	Mountain and upland Soils (2250 t. in 4 yrs.)
62	M. Koike	Nagano	8.63	10.57	Si. L.	33	good	Mountain and upland Soils (2270 t. in 5 yrs.)
63	S. Ishikawa	Akita	8.63	10.89	C.L.	17	good	Mud (a little)
64	N. Kitahara	Nagano	9.14	11.02	C.L.	19	good	Mountain Soil, iron-rich Soil
65	K. Satō	Akita	8.94	10.76	C.L.	15	good	
66	A. Watanabe	Akita	8.98	10.67	C.L.	15	good	
	Average		9.10	11.08		19		

* S.L. =sandy loam, L.=loam, C.L.=clayey loam, Si.L.=silty loam. ** L.=lowland nursery, U.=

prizewinners in the "Japan Rice-yield Contest", 1949~66

Farm-yard manure (t./ha.)	Date of trans-planting	Date of harvest	Applications of fertilizer nutrients (kg./ha.)			Irrigation and drainage		Type of nursery **
			N	P_2O_5	K_2O	Intermittent irrigation	Temporary drainage	
7.5	Jun. 17	Nov. 4	224	104	181	Intermittent draining during autumn	Once for 3 days	L.
7.5	Jun. 25	Nov. 8	218	166	203		Once for 23 days	I.
11.3	Jun. 6	Nov. 4	225	83	173	"Drainage every 4 days"	Once for 8 days	L.
22.5	Jun. 26	Nov. 12	216	114	207		Once for 14 days	L.
26.3	Jul. 8	Nov. 14	232	153	262		Once for 7 days	L.
30.0	May 28	Oct. 18	338	214	432	Shallow water in the morning natural reduction	4 times for 27 days in total	I. oilpaper-covered
11.3	May 22	Oct. 14	223	94	240	do	6 times for 22 days in total	I. 〃
22.5	Jun. 2	Oct. 21	252	130	242	"repeated shallow water draining out"	3 times fof 12 days in total	I. 〃
11.3	May 26	Oct. 24	219	105	214		Once for 6 days	I. 〃
18.8	May 25	Oct. 21	211	143	253	"Drainage every 3 or 4 days"	Once for 7 days	I. vinyl-covered
30.0	May 16	Oct. 6	225	180	239	"Drainage every 2 or 3 days"	Once for 6 days	U. vinyl-covered
22.5	May 10	Oct. 11	240	150	293	"Shallow water in the evening: natural reduction"	3 times for 9 days in total	incubator
16.0	May 26	Oct. 6	285	277	319	"Draining out at noon: shallow water in the of ternoon"	3 times for 8 days in total	U. vinyl-covered
15.0	May 22	Oct. 15	293	450	305	do	3 times for 9 days in total	U. 〃
22.5	May 21	Oct. 8	219	143	252	"Drying for 3 days: Irrigation for 1 day"	Once for 13 days	U. 〃
Rawstraw 4.0 this year	May 20	Oct. 13	120	158	178	"Drying for 2 days: Irrigation for 1 day"	3 times for 9 days in total	U. 〃
19.0	May 28	Oct. 11	252	185	206	"Drying for 1 day: Irrigation for 2 days"		I. polyetlcylene-covered
12.0	May 31	Oct. 11	173	216	139	"repeated Draining-out-Running Watar"	3 times for 34 days in total	I. 〃
17.0			231	170	241			

upland nursery, I.=intermediate nursery.