Farmers' Perception and Actual Response to Drought
- A Case Study of Animal Husbandry in Adana and Konya Regions -

Takeshi MARU
Laboratory of International Rural Development,
Graduate School of Agriculture, Kyoto University
Kitashirakawaoiwake-cho, Sakyo-ku, Kyoto 606-8502, JAPAN.
e-mail: marl@kais.kyoto-u.ac.jp

1. Introduction

We analyzed the effects of a drought in 2004 on the milk production in Adana and Konya regions using outcomes of our farm surveys[1]. Sample villages and households of the surveys are as follows:

2002
Adana
-1- Kadiköy (Irrigated: IR henceforth, 32Households)
-2- Taşçi (IR, 25Households)
-3- Yeniyayla (Rainfed: RF henceforth, 28Households)
-4- Çiçekli (RF, 24Households)
Konya
-5- Okçu (IR, 24Households)
-6- Meydan (RF, 17Households)

2004
Adana
-15- Yeniköy (IR, 7Households)
-16- Geçitli (IR, 25Households)
-17- Boztahta (RF, 33Households)
Konya
-18- Arıkören (IR, 34Households)
-19- Yağlıbayat (RF, 33Households)

Surveyed villages belong to 2 areas - Adana and Konya regions. In Adana region, farmers mainly keep cattle, they also raise sheep and goat in mountaineous area in small scale. In Konya region, farmers still utilize pastureland extensively and engage in traditional-style grazing. They keep a lot of sheep and goat, especially in rainfed area. According to weather observation data in 2002, in Adana, the average temperature was almost same as the normal year and rainfall was less than the normal year. In Konya, and the average temperature was slightly lower than the normal year and rainfall is littlebit more than the normal year. Regarding the weather in 2004, observation data is not available, but according to farmers' perception of weather condition, in 2004, average temperature was higher than the normal year and rainfall was considerably less than the normal year in Adana region, and average temperature was slightly higher than the normal year and rainfall was less than the normal year in Konya region.

2. Farmers' Perception of Accidental Big Weather Changes and Responses of Input to It

In 2004 survey, we asked dairy farmers the following questions:
A. Whether accidental big weather changes affect animal husbandry or not,
B. Which month's accidental big weather change (average temperature is higher/lower, or rainfall is more/less than the normal year) affects animal husbandry mostly,
C. Whether farmers would change (increased, not changed or decreased) the use of input (concentrate, pasture, fodder, veterinary and shepherd).

The answers to the question A are shown in Table 1.

[1] The Author appreciate that Dr. Onur Erkan, Dr. Cennet Oğuz, Dr. Ufuk Gültekin, Mr. Kemalletin Taşdan, Mr. Baran Yaşar, Mr. Ali Yalçin, Mr. Mevlüt Gül, and Mr. Hasan Arısoy helped us to conduct our survey.

Table 1. Whether Farmers Think Accidental Big Weather Changes Affect Animal Husbandry or Not

(Unit: Number of households)

		Not affect*3	Affect*4
Adana	Not keep*1	32	0
	Keep*2	18	15
Konya	Not keep*1	8	1
	Keep*2	1	56

Note*1: Farmer who doesn't keep livestock.
Note*2: Farmer who keeps livestock.
Note*3: Farmer who think accidental big weather changes don't affect animal husbandry.
Note*4: Farmers who think accidental big weather changes affect animal husbandry.
Source: Prepared by the Author from Survey Data.

Table 2 and Table 3 show the answers to the question B by farmers who answered that accidental big weather changes affect animal husbandry in the question A.

Table 2. Month Farmers Think Accidental Big Weather Changes Affect Animal Husbandry Mostly: in Adana

(Unit: Number of Answers)

Compared to Normal Year		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
Temperature	Higher	0	0	0	0	1	1	4	9	0	0	0	0	15
	Lower	1	0	0	1	1	1	1	0	0	0	0	0	5
Rainfall	More	2	0	0	0	1	0	0	0	0	0	0	1	4
	Less	0	0	0	0	1	0	0	0	1	0	0	1	3

Source: Prepared by the Author from Survey Data.

Table 3. Month Farmers Think Accidental Big Weather Changes Affect Animal Husbandry Mostly: in Konya

(Unit: Number of Answers)

Compared to Normal Year		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
Temperature	Higher	0	0	1	6	18	12	20	26	0	1	1	0	85
	Lower	12	17	16	10	6	2	0	0	0	4	4	6	77
Rainfall	More	6	8	6	26	24	5	0	0	0	2	1	1	79
	Less	0	0	4	33	35	4	0	1	1	0	1	0	79

Note: In this question, some farmers answered multiple months. Therefore, we added those months.
Source: Prepared by the Author from Survey Data.

According to Table 2, Adana farmers think that high temperature affects animal husbandry most. The reason for this perception is that dairy farmers in Adana region generally keep livestock in barns without using pastureland, and that cattle are easily affected by heat. In fact, half of dairy farmers who answered that higher temperature compared to the normal year in summer affected animal husbandry actually mentioned that cattle are easily exhausted by high temperature.

Table 3 shows the results about Konya region. Like the case of Adana region, Konya farmers think too high/low temperature in summer/winter cause damage to their livestock. When it comes to rainfall, they think that rainfall in spring affects grass growth in pastureland. More than half of dairy farmers in Konya region actually answered that rainfall in April and May is most important for grass growth. Konya dairy farmers care about grass growth on pastureland because they still rely much on grazing to feed their livestock.

In 2004 survey, we let dairy farmers answer '2' if they would increase, '1' if they would not change and '0' if they would reduce use of input (concentrate, pastureland, fodder, veterinary and shepherd) when accidental big weather changes occurred. Table 4 and Table 5 show the average values.

Table 4. Farmers' Will to Adjust Requirements Input When Accidental Big Weather Changes Occur: in Adana

Compared to Normal Year			Concentrate Use	Pasture Use	Fodder Use	Veterinary Use	Shephard Use
Temperature	Higher	Average Value	1.06	0.23	0.92	1.55	0.50
		No. of Answers	15	13	13	9	2
	Lower	Average Value	1.00	1.25	1.33	1.00	1.00
		No. of Answers	5	4	3	1	1
Rainfall	More	Average Value	1.50	0.67	2.00	1.50	1.00
		No. of Answers	4	3	3	2	1
	Less	Average Value	1.67	0.67	1.50	1.00	1.00
		No. of Answers	3	3	2	1	1

Source: Prepared by the Author from Survey Data.

Table 5. Farmers' Will to Adjust Requirements Input When Accidental Big Weather Changes Occur: in Konya

Compared to Normal Year			Concentrate Use	Pasture Use	Fodder Use	Veterinary Use	Shephard Use
Temperature	Higher	Average Value	1.06	0.54	1.00	1.29	0.76
		No. of Answers	50	54	57	55	49
	Lower	Average Value	1.42	0.87	1.35	1.29	0.98
		No. of Answers	50	54	57	55	49
Rainfall	More	Average Value	0.45	0.87	0.79	0.73	0.77
		No. of Answers	47	52	53	51	48
	Less	Average Value	1.77	0.83	1.38	1.27	1.06
		No. of Answers	47	52	53	51	48

Source: Prepared by the Author from Survey Data.

According to Table 4, Adana farmers will reduce pasture use immediately, and increase veterinary use and won't adjust concentrate use when temperature is higher than the normal year. The reasons are as follows. First, grazing cattle under too high temperature is not good for health condition of cattle. Second, dairy farmers in Adana region generally grow livestock in barns and main feed is not grass on pastureland but concentrate.

Table 5 shows the results for Konya region. When temperature is higher than the normal year, dairy farmers will reduce pasture and shepherd use and increase veterinary use not to let livestock be exhausted. However, they will not adjust concentrate and fodder use because grass growth on pastureland is not considerably deteriorated by high temperature. When temperature is lower than the normal year, they increase concentrate and fodder use to make livestock fat to resist low temperature. When rainfall is more than the normal year, condition of grass growth in pastureland gets better and thus dairy farmers can graze

livestock more efficiently with less time pastureland use, and therefore they will reduce concentrate and fodder use. When rainfall is less than the normal year, grass growth in pastureland gets poorer, and therefore dairy farmers in Konya have to substitute feed such as concentrate for grass.

3. Estimation of Production Function of Milk

We examine the technical effect of an accidental big weather change - this time we focus on a drought -, by introducing the coefficient dummy of drought for concentrate in Cobb-Douglas production function of milk yield. We estimate production function by Adana region and Konya region separately. Data collected in 2002 and those in 2004 are used as one pool dataset. Villages where farm survey was conducted in 2002 and those in 2004 do not correspond to each other. But characteristics - for example, number of livestock, ratio of grazing to zero-grazing, etc - of villages located on each region in 2002 and those of 2004 are similar to each other. Therefore, we assume that villages in same region and area have same technical condition of animal husbandry to compare difference between the drought year and the normal year. We don't assume that this production function is homogeneous function of degree 1. Table 6 shows the definition of variables for production function. Table 7 and Table 8 show the estimation results.

Table 6. Variable Description of Production Function of Milk Yield

		Definitions	Unit
Dependent Variable	MLKYLD	Milk Yield	kg
Explanatory Variables	LNANMLNO	Adjusted Number of Livestock*1	Head
	LNCCNTRT	Amount of Concentrate	kg
	LDCCNTRT	Coefficient Dummy of Drought for Concentrate	kg

Note*1: According to difference of milk yield between cattle and sheep, we calculated this variable as: 104fold number of cattle and number of sheep
Source: Prepared by the Author from Survey Data.

Table 7. Production Function of Milk Yield: in Adana

Number of observations: 64, Adjusted R-squared: 0.395			
Variables	Coefficients	t-statistic	p-value
LNANMLNO	0.385	3.42 ***	0.001
LNCCNTRT	0.180	3.54 ***	0.001
LDCCNTRT	- 0.056	-2.67 ***	0.010
CONSTANT	4.994	7.60 ***	0.000

Note: ***Significant at 1% Level.
Source: Prepared by the Author from Survey Data.

Table 8. Production Function of Milk Yield: in Konya

Number of observations: 66, Adjusted R-squared: 0.668			
Variables	Coefficients	t-statistic	p-value
LNANMLNO	0.703	8.79 ***	0.000
LNCCNTRT	0.001	0.01	0.988
LDCCNTRT	0.062	2.73 ***	0.008
CONSTANT	3.810	10.37 ***	0.000

Note: ***Significant at 1% Level.
Source: Prepared by the Author from Survey Data.

As shown in Table 7, in Adana region, the drought reduces the elasticity of milk to concentrate input. A possible reason for this result is that livestock were exhausted by heat. Therefore, dairy farmers in Adana region should decrease concentrate use. But as we showed in Table 4, they won't adjust concentrate input when average temperature is higher than the normal year. This result indicates that Adana dairy farmers' will to adjust requirement input is not suitable.[2]

Table 8 shows the result about Konya region. The coefficient of dummy became positive. This means that the drought enhances the effect of concentrate use to milk yield more. In the normal year, dairy farmers in Konya region can graze their livestock in pastureland and thus they don't use concentrate as main feed. That is a deficient input of concentrate. But in the drought year, as mentioned above, they must substitute concentrate for grass in pastureland. Consequently, the elasticity of milk yield to concentrate when they cannot utilize pastureland increases from the elasticity when they can utilize pastureland. This estimated result is consistent with the perception of dairy farmers in Konya region that they should increase concentrate use when a drought occurs. This result indicates that perception of dairy farmers in Konya region are suitable.[3]

4. Conclusions

In this report, we studied how were dairy farmers' perception and will to respond to accidental big weather changes, and whether their actual responses to drought had been rational or not.

[2] Nevertheless, there is no substitution for concentrate in Adana animal husbandry. Hence, there is no other way for their will to be like that.

[3] However, dairy farmers in Konya region cannot utilize grass in pastureland, as they want. Feeding livestock with concentrate costs too much for traditional dairy farmers - risk averters.

Dairy farmers in Adana region generally think that accidental big weather changes don't affect animal husbandry, but half of them recognized that too high temperature affect animal husbandry. From the result of estimation of production function, the drought - in fact, too high temperature in summer in the case of Adana region - actually had a negative influence on animal husbandry. At this point, their will to respond that they wouldn't adjust concentrate use was not suitable.

As for dairy farmers in Konya region, they recognize that accidental big weather changes affect animal husbandry and this time drought had a certain effect on milk production. The result of estimation of production function indicated that the drought actually had a positive influence on animal husbandry, and their will to increase concentrate input was rational.

This study is a short-term analysis and farmers can adjust their activities in more drastic ways, for example they will adjust livestock number or stop utilizing pastureland, at the case of long-term climate change. But this study shows that their perception of effect of accidental big weather changes are appropriate, and farmers do act adequately under given conditions, and indicates one of their reactions to the long-term climate change.

5. References

[1] Hiroshi TSUJII, M. KUSADOKORO, T. MARU, U. GÜLTEKİN and K. TAŞDAN, 2005: "Current research status of the socio-economic team of the ICCAP and one analysis of the impacts of weather to wheat production in Adana and Konya", in Research Team for the ICCAP Project, Research Institute for Humanity and Nature eds. *Proceedings of the International Workshop for the Research Project on the Impact of Climate Change on Agricultural Production System in Arid Areas (ICCAP)*, Research Institute for Humanity and Nature, pp. 27 - 34.