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Strategic Workforce Planning for Agricultural Insurance Claims Adjusters: Insights from Korea's Evolving Business Landscape

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Abstract

Purpose: This study forecasts the medium- to long-term need for adjusters and proposes strategies to effectively manage the workforce. By determining the optimal number of adjusters, this study aims to stabilize crop insurance operations and address specialization and supply issues, ultimately enhancing industry reliability within the broader context of the Asian business environment. **Research design, data and methodology:** It utilized agricultural insurance data and survey personnel information from Nonghyup Property & Casualty Insurance. A negative binomial regression model was employed to estimate the number of loss assessment cases. The optimal number of agricultural insurance claims adjusters was determined by multiplying the adjusters required per case by estimated loss cases, considering total budget and expected income per person. **Results:** The optimal number of agricultural insurance claims adjusters was projected to range between 9,411 and 18,156 in the long term. These findings highlight critical gaps in workforce capacity and provide actionable insights for staffing strategies and operational efficiency. **Conclusions:** The continuous increase in enrollment rates and shortage of loss assessment personnel require strategic workforce planning, including performance-based pay scales and fostering competition among adjusters. These strategies ensure sustainability and offer a framework for similar agricultural and environmental conditions across other Asian countries.

Keywords : Agricultural Insurance Claims Adjuster, Agricultural Loss Assessment, Workforce Management, Crop Disaster Insurance

JEL Classification Code: G22, J21, Q18

1. Introduction

In many countries across Asia, agriculture continues to serve as a primary source of livelihood (Mahul & Stutley, 2010; Briones & Felipe, 2013), and in Korea as well, agriculture still plays a significant role. Owing to the nature of crop growth, it is highly affected by weather conditions, diseases, pests, and other disasters (Klomp & Hoogezand, 2018). Hence, the annual income of individual farms greatly depends on the occurrence of such disasters. Recently, the frequency and scale of agricultural disasters have been steadily increasing (Li et al., 2022), ultimately resulting in considerable damage to farms. In Asia, while efforts are being made to explore various measures to adapt to disasters

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such as climate change and their impact on crop production, institutional structures to alleviate producers' economic hardships, beyond technical solutions, have yet to be established (Aryal et al., 2020). With the growing need for a social safety net to compensate for farm damage caused by natural disasters, crop disaster insurance has garnered significant attention in Korea and is playing an increasingly important role (Ahn et al., 2015; Kang & Chung, 2017). The insurance enrollment rate, which was only 17.5% at the time of its introduction in 2001, has steadily increased over the years, reaching 50% in 2022. In 2022, approximately 165,000 out of 515,000 insured farms received insurance indemnities totaling approximately 559.8 billion KRW. This trend indicates the emergence of crop disaster insurance as a major means of stabilizing farm management.

However, despite the growth in the scale of crop insurance, data for calculating appropriate insurance premiums are still insufficient, and procedural issues regarding insurance coverage and the scope of insurance payments remain unresolved (Chung, 2013; Chung & Choi, 2013; Jeong et al., 2023). Most importantly, the speed and fairness of agricultural loss assessment present important concerns. Agricultural loss assessment refers to the process of verifying damage and assessing the loss amount when insurance claims arise due to natural disasters, diseases, pests, fires, and other agricultural disasters. As the results of loss assessment determine the compensation amount for farms, it is a crucial task that must be carried out meticulously within the crop insurance program.

Agricultural loss assessment is directly linked to insurance indemnity amounts and can lead to high loss ratios, which may, in turn, raise insurance premiums and decrease the number of policyholders (Kim et al., 2003). Therefore, ensuring a sufficient number of specialized and qualified agricultural insurance claims adjusters who can perform timely and objective loss assessments is essential for maintaining the stability of crop insurance in the medium to long term (Yoon et al., 2023). Previous research on crop insurance loss assessment has focused primarily on the need for training and managing specialized personnel (Kil et al., 2015; Eom et al., 2018) and on identifying problems and seeking improvements in loss assessment practices (Choi et al., 2010; Kim et al., 2020). However, few studies have specifically addressed medium- to long-term workforce management strategies and the professional specialization of agricultural insurance claims adjustments.

Although the government has introduced a system for certifying agricultural insurance claims adjusters to develop specialized personnel, disparities between different types of loss assessors and variations in assessment results have led to decreased reliability. Additionally, the overproduction of certified adjusters owing to the recent rapid increase in their numbers raises important concerns. Insufficient numbers of loss assessors during disasters is a problem, but an excess of them is also an issue. Therefore, a comprehensive review and analysis of the appropriate number of loss assessors is required.

Accordingly, the current study aims to predict the medium- to long-term requirements for agricultural insurance claims adjusters and discuss practical management measures. By determining the optimal number of loss assessors, this study seeks to establish a medium- to long-term workforce management plan that can contribute to the stable operation of crop insurance programs. This approach will help develop specialized loss assessment personnel through system improvements and enhanced certification management, ultimately contributing to the stabilization of the insurance business.

2. Duties and Status of Agricultural Insurance Claims Adjusters

2.1. Duties of Agricultural Insurance Claims Adjusters

According to Article 11, Paragraph 1 of the Agricultural and Fishery Disaster Insurance Act, disaster insurance providers may appoint individuals with knowledge and experience regarding the insurance subject or experts as agricultural loss assessors to conduct loss assessments, or they may assign the task to agricultural insurance claims adjusters or certified loss adjusters. An agricultural loss assessor is defined as a person appointed by a disaster insurance provider to handle loss assessment tasks based on the criteria set forth in Article 11, Paragraph 1 of the Act and in Article 12, Paragraph 1 of the Enforcement Decree. This role involves individuals engaged in agricultural finance and related fields who are appointed to perform crop disaster loss assessments.

An agricultural insurance claims adjuster performs loss assessments specifically for agricultural disaster insurance and has obtained the national professional qualification established under the Agricultural and Fishery Disaster Insurance Act. According to Article 186 of the Insurance Business Act, a certified loss adjuster is responsible for handling damage and insurance claims related to general insurance incidents and may use assistants to carry out loss adjusting duties if necessary. Although the roles of certified loss adjusters and agricultural insurance claims adjusters may appear similar, the activities of agricultural insurance claims adjusters are limited to loss assessments related to natural disasters affecting crops, whereas those of certified loss adjusters are not confined to agricultural disasters and include loss assessments for a broader range of insurance incidents.

With the implementation of the Agricultural and Fishery Disaster Insurance Act, the scope of crop disaster insurance has expanded. However, various issues, including inefficiencies in inspection and the scope of coverage, have highlighted the ongoing need for specialized personnel in crop disaster loss assessment. In response, the government introduced the national qualification system for agricultural insurance claims adjusters in 2015 to ensure that specialized personnel could perform loss assessment tasks according to standardized processes. Previously, loss assessments for crop disasters were primarily conducted by agricultural loss assessors or general certified loss adjusters; however, since the introduction of the national qualification system, the proportion of loss assessments performed by agricultural insurance claims adjusters has been gradually increasing.

2.2. Current Status of Agricultural Insurance Claims Adjusters

To enhance the effectiveness of agricultural disaster insurance programs, the Ministry of Agriculture, Food, and Rural Affairs (MAFRA) has introduced a national professional qualification system for agricultural insurance claims adjusters. This system aims to develop skilled personnel by granting the agricultural insurance claims adjuster qualification to those who pass the qualification exams. The Agricultural Policy Insurance and Finance Service is responsible for managing the operation of the agricultural insurance claims adjuster system while the Human Resources Development Service of Korea handles the administration, management, and decision making related to the qualification exams.

The qualification exam for agricultural insurance claims adjusters consists of two stages: the first and second exams. It has no specific eligibility restrictions on education, sex, age, experience, or nationality. Those who pass the qualification exams are awarded certificates by MAFRA. The details of the qualification exam for agricultural insurance claims adjusters are presented in Table 1. Since its introduction, the qualification exam for agricultural insurance claims adjusters has been administered annually, leading to a continuous supply of agricultural insurance claims adjusters. The number of successful candidates for the qualification exam fluctuated from 430 in 2015 to 566 in 2020, with a significant increase beginning in 2021. In particular, the number of successful candidates was 2,233 in 2021 and 1,017 in 2022 (MAFRA, 2023).

Table 1: Examination Procedures for Agriculture Insurance Claims Adjusters

Exam		Main Contents
1st	Subject	Commercial Law: Insurance Section
		Regulations on Agricultural and Fisheries Disaster Insurance
		Introduction to Agriculture: Crop Production and Horticulture
	Format	Multiple-choice Questions
		25 questions per subject (total of 75 questions)
		90-minute Exam
2nd round	Subject	Theory and Practice of Crop and Livestock Disaster Insurance
		Theory and Practice of Loss Assessment for Agricultural Disaster
	Format	Short Answer or Essay Questions
		10 Questions per Subject (5 Short Answer and 5 Essay)
		120-minute Exam

Source: Human Resources Development Service of Korea, 2023.

As of the end of 2022, the number of loss assessment personnel was 9,163, of which 4,482 individuals (48.9%) had participated in investigations and received investigator allowances. Moreover, 3,095 (33.8%) of the loan assessment personnel during this period were agricultural insurance claims adjusters. Among the agricultural insurance claims adjusters, 26 were local adjusters (0.2% of the total loss assessment personnel), 2,712 were affiliated with associations (29.6%), and 357 were affiliated with corporations (3.9%).

Table 2: Allowances based on Converted Farmland Index and Number of Contract Holders

		Converted Farmland Index				Number of Contract Holders					
		Base	0.1~1.5	1.6~14.9	≥15.0	Base	1	2	3	4	≥5
Local	Senior	220	22	Base × App. Rate	220	60	12	24	36	48	60
	General	160	16		160	40	8	16	24	32	40
	Assistant	130	13		130	-					
Association		240	24		240	60	12	24	36	48	60
Corp.	General	280	28		280	70	14	28	42	56	70
	Junior	200	20		200	40	8	16	24	32	40
Application Rate		·	10%		100%	·	20%	40%	60%	80%	100%

Source: Internal data from Nonghyup Property & Casualty Insurance.
Note: The unit is thousand KRW.

The allowances paid to crop disaster insurance investigators include investigation allowances and other fees. Investigation allowances cover the compensation for labor while the other fees cover daily allowances, area manager fees, transportation costs, meal expenses, and accommodation costs. Investigation allowances are divided into conversion farmland and contract allowances. Conversion farmland allowances are provided up to 15.0 units per day based on the converted farmland area, and contract allowances are differentiated from one to five individuals based on the number of contracts per day (Table 2).

3. Methodology

This study aims to calculate the optimal number of agricultural insurance claims adjusters required for crop disaster insurance. Determining the appropriate number of agricultural insurance claims adjusters involves two main steps: estimating the number of cases and calculating the number of assessors required per loss assessment case through the distribution of loss assessment personnel.

The number of loss assessment cases is influenced by enrollment rates and loss ratios, with the number of cases generally having a positive relationship with increases in subscription rates and loss ratios (Kim et al., 2020). The association of the number of loss assessment cases with subscription rates and loss ratios can be expressed by the following function:

$$\ln(E[Y_t]) = \alpha + \beta_1 M_t + \beta_2 \lambda_t + \sum_{i=1}^{N} \gamma_i C_i + \delta_t D_t \quad (1)$$

where Y_t represents the number of loss assessment cases occurring during the period, M_t denotes the enrollment rate for the period, λ_t is the loss ratio for the period, C_i is dummy variable for item, and D_t includes other variables or policy dummy variables that may affect the loss assessment. As the occurrence of loss assessment cases represents a special form of event occurrence per period, a Poisson distribution must be assumed to estimate the number of times an event occurs within a unit time (Piza, 2012; von Mises, 1964). This study utilizes a negative binomial regression model based on a Poisson distribution to estimate the number of loss assessment cases. The negative binomial regression model is widely used to analyze count data and provides advantages by allowing for cases where the normal distribution (Gaussian distribution) is not applicable, thus relaxing the Poisson distribution's restrictive assumption that variance equals the mean and offering higher efficiency in model fitting (Hilbe, 2011). The negative binomial regression model is a nonlinear probability model that estimates coefficients by maximizing the log-likelihood function as follows:

$$\ln L = \sum_{t=1}^{T} ln\left[\frac{e^{-\exp(x_t\beta)}(\exp(x_t\beta))^{y_t}}{y_t!}\right] \quad (2)$$

After establishing the main categories, the overall scope of the loss assessment cases is determined by configuring the unit increases in enrollment rates and loss ratios. The number of loss assessment cases for item i can be derived using Equation (1). The derived number of loss assessment cases is multiplied by the "inverse of cases per day" for each item to calculate the working days for loss assessment R_i as follows:

$$R_i = \frac{\hat{Y}_i}{X_i} \quad (3)$$

where X_i represents the number of loss assessment cases per day and $\hat{Y}_i$ denotes the estimated number of loss assessment cases. The total budget for the assessment personnel is calculated by multiplying the number of working days for loss assessment by the daily allowance per loss assessment case. The total budget is then divided by the expected income per person to determine the optimal number of personnel required for loss assessment Z_i for each item.

$$Z_i = \frac{\bar{w}R_i}{m} \quad (4)$$

where $\bar{w}$ represents the per-case allowance and m denotes the expected income per person.

This study calculates the probability distribution for loss assessment personnel and establishes the number of assessors H_i required per loss assessment case for each item. The proportion ρ_i of agricultural insurance claims adjusters among the total loss assessment personnel is applied to the loss assessment personnel to estimate the required number of agricultural insurance claims adjusters per loss assessment case L_i for each item.

$$L_i = \rho_i H_i \quad (5)$$

where ρ_i represents the proportion of agricultural insurance claims adjusters among the total loss assessment personnel for each item and H_i denotes the number of assessors per loss assessment case for each item. The optimal number of agricultural insurance claims adjusters for each item can be determined by multiplying the derived number of agricultural insurance claims adjusters required per case by the estimated number of loss assessment cases. The total number of agricultural insurance claims adjusters required for crop insurance can then be calculated by summing the optimal number of adjusters for each item.

$$A = \sum_{i}^{N} L_i Z_i \quad (6)$$

where L_i represents the number of agricultural insurance claims adjusters needed per case for item i and Z_i denotes the optimal number of loss assessment cases required for each item. If needed, the number of assessors per case H_i can be flexibly calculated based on operational strategies, such as applying average, minimum, and maximum values or percentiles. This step allows for the determination of the total number of agricultural insurance claims adjusters required.

4. Data

This study utilized agricultural policy insurance performance and insurance payment data provided by the Agricultural Policy Insurance and Finance Service and survey personnel information from the Nonghyup Property & Casualty Insurance for analysis. As of 2023, crop disaster insurance covered 70 items that can be broadly categorized into fruit trees (four types), other fruit trees, food crops, vegetables, special crops, forest products, and facility crops (Table 3). Additionally, agricultural facilities such as single-span greenhouses, multi-span greenhouses, and glass greenhouses are covered by crop disaster insurance. Food crops were divided into categories with high proportions, such as rice and non-rice food crops, resulting in a dataset that was restructured into nine categories, including agricultural facilities. Each category included annual information on subscription rates, loss ratios, number of loss assessment cases, and survey personnel. Analysis was conducted using aggregated data by category from 2016 to 2022.

Table 3: Crops covered by Agricultural Insurance

Categories	Covered Crops
Major Fruits	Apple, Pear, Non-astringent Persimmon, Astringent Persimmon
Other Fruits	Tangerine, Peach, Grape, Plum, Mumes, Korean kiwifruit, Fig, Yuzu, Apricot
Cereal Crops	Rice, Wheat, Potato, Sweet Potato, Corn, Soybean, Buckwheat, Red Bean, Barley, Oats
Vegetables	Onion, Red Pepper, Garlic, Cabbage, Broccoli, Chinese Cabbage, Radish, Kabocha Squash, Carrot, Green Onion, Spinach, Lettuce
Specialty Crops	Mulberry, Ginseng, Tea, Oyster Mushroom, King Oyster Mushroom, Button Mushroom
Forest Products	Shiitake Mushroom, Jujube, Chestnut, Black Raspberry, Schisandra Berry, Walnut
Greenhouse Crops	Strawberry, Cucumber, Cham-Wei (Korean Melon), Tomato, Chrysanthemum, Watermelon, Rose, Fresh Pepper, Pumpkin, Melon, Paprika, Lettuce, Chive, Spinach, Eggplant, Green Onion, Chinese Cabbage, Radish, Lily, Carnation, Minari (Korean Watercress), Crown Daisy, Potato

Note: Duplicate crops are those that exhibit differences in cultivation methods or growing practices.

The personnel allocation per loss assessment case by category is presented in Table 4. The number of personnel per loss assessment case fluctuated by year; however, one to three individuals were generally involved in the loss assessment. The number of agricultural insurance claims adjusters per loss assessment case reflected the proportion of adjusters among all personnel involved in the loss assessment. Examining the personnel involved per loss assessment case by item showed that fruit trees generally had a higher number of participants, indicating that the difficulty of loss assessment for these items was relatively high. The average number of personnel per loss assessment case was 2.70 (with 2.54 being agricultural insurance claims adjusters) for major fruits and 3.17 (with 2.99 being agricultural insurance claims adjusters) for other fruits. For rice, the average number of personnel involved per loss assessment case was 1.47 (with 1.39 being agricultural insurance claims adjusters), which was lower than that for the other items. For items excluding fruit trees and rice, the average number of personnel per loss assessment case was 1.29 (with 1.22 being agricultural insurance claims adjusters). Specifically, forest products showed a higher participation rate (2.67 personnel per case, with 2.51 being agricultural insurance claims adjusters) while facility crops had a lower participation rate.

Table 4: Results of Calculation of Personnel Allocation per Loss Assessment Case

Categories	Personnel Allocation per Loss Assessment Case								AIAC
	2016	2017	2018	2019	2020	2021	2022	Mean	
Fruits	3.00	2.96	2.7	2.62	3.08	2.63	2.67	2.80	2.63
Major Fruit	2.97	2.92	2.67	2.50	2.99	2.44	2.51	2.70	2.54
Other Fruit	3.44	3.49	3.69	3.25	3.35	2.94	3.06	3.17	2.99
Rice	1.47	1.34	1.49	1.44	1.47	1.73	1.13	1.47	1.39
Other Crops	1.60	1.58	1.39	1.29	1.21	1.25	1.38	1.29	1.22
Cereal Crop	2.15	2.00	2.25	1.86	2.06	2.03	1.43	1.91	1.80
GH Crop	1.28	1.09	1.01	1.04	1.00	1.01	1.17	1.04	0.98
Forest Product	2.38	2.14	3.22	2.35	3.07	2.98	2.24	2.67	2.51
Vegetable	2.19	2.31	2.32	2.27	1.67	1.66	1.72	1.82	1.71
Specialty Crop	1.91	1.90	2.04	1.99	1.25	1.36	1.34	1.48	1.39
Other	2.76	2.55	2.33	2.50	2.06	2.12	1.67	2.36	2.22
Ag Facilities	1.29	1.11	1.01	1.04	1.00	1.01	1.15	1.04	0.98

Source: Internal data from Nonghyup Property & Casualty Insurance.
Note: AICA stands for Agriculture Insurance Claims Adjusters. Agricultural Facilities, which are difficult to classify as crops, are included under Other Crops in the classification system. The unit is personnel.

5. Duties and Status of Agricultural Insurance Claims Adjusters

5.1. Results of Estimation of Number of Loss Assessment Cases

In this study, a negative binomial regression model was used to estimate the number of loss assessment cases, incorporating variables such as enrollment rate, loss rate, item category, and year dummy variables (Table 5). As a result of the estimation, the alpha value was found to be

greater than 0, suggesting that the negative binomial regression model is appropriate (Ismail & Jemain, 2007). When the mean and variance are equal, the alpha value is 0, indicating that the Poisson regression model is suitable (Madanat & Ibrahim, 1995). However, when the variance exceeds the mean, leading to overdispersion, the negative binomial regression model is a better fit (Gardner et al., 1995). After performing the Poisson regression model and checking the goodness-of-fit, it was found that the Pearson chi-squared statistic relative to the degrees of freedom exceeded 10, further supporting the appropriateness of the negative binomial regression model over the Poisson regression model. The model's estimation results indicated that enrollment and loss rates were statistically significant and had a positive effect on the number of loss assessment cases. This finding supports prior research that shows a positive relationship between the number of loss assessment cases and increases in enrollment and loss rates. Applying the Incident Rate Ratio (IRR) results to estimate the incidence rate of loss assessment cases, it was found that the incidence rate of loss assessment cases increases by approximately 3.89% and 0.35% when enrollment rates and loss rates increase by 1 percentage point, respectively.

The estimation results revealed that most item categories had a significant relationship with the number of cases, suggesting that the number of loss assessment cases can vary significantly depending on the type of crop being assessed. For the visibility of the coefficients related to item variables, agricultural facilities that were difficult to classify as crops were set as reference variables. All categories, except for the four major fruits and other fruits, showed statistically significant results. The results suggested that rice, which had the highest estimate, was assessed relatively frequently and that forest products with the lowest estimate were assessed less frequently. In terms of the size of the estimated coefficients and IRR, fruit-related categories had the second-highest frequency of assessment after rice, although the results were not statistically significant. This outcome could be attributed to the large variability in the number of cases for fruit-related items over time, indicating inconsistent assessment frequencies for these categories. The SD1 and SD2 variables represent dummy variables for the period of 2019–2021 and for the year 2022, respectively. SD1 was set to account for the sharp increase in the number of loss assessment cases during the 2019–2021 period while SD2 was established to account for the significant decrease in 2022. The estimation results showed that these year dummies were statistically significant and exhibited positive values.

Table 5: Estimation of the Number of Loss Assessment Cases

Variable	Estimate	SE	z	IRR
Enrollment Rate	0.0381***	0.0078	4.88	1.0389
Loss Ratio	0.0035**	0.0014	2.50	1.0035
Major Fruits	-0.1343	0.3408	-0.39	0.8743
Other Fruits	-0.0884	0.2862	-0.31	0.9154
Rice	0.5131*	0.3025	1.70	1.6705
GH Crops	-0.7281***	0.2834	-2.57	0.4828
Cereal Crops	-0.8618***	0.2938	-2.93	0.4224
Forest Products	-4.2244***	0.2649	-15.95	0.0146
Vegetables	-0.7240***	0.2827	-2.56	0.4848
Specialty Crops	-2.5577***	0.2613	-9.79	0.0775
SD1	1.0053***	0.1725	5.83	2.7327
SD2	0.4951**	0.2221	2.23	1.6407
constant	9.7181***	0.4313	22.22	16,616
lnalpha	-1.4543	0.1720		
alpha	0.2336	0.0402		

Note: *** p < 0.01, ** p < 0.05, * p < 0.1.

Based on the estimated number of loss assessment cases, this study aimed to determine the appropriate scale of loss assessment personnel. Prediction scenarios for the number of loss assessment cases were established to account for the changes in enrollment rates and loss ratios. Given that enrollment rates and loss ratios exert a positive effect on the number of loss assessment cases, a continuous increase in enrollment rate resulting from the expansion and promotion of crop disaster insurance can be inferred.

Based on the estimated enrollment rate, the prediction indicated an increase of 3.64 percentage points (Figure 1). By applying this increase rate to the 2022 enrollment rate of 49.9%, the enrollment rate was forecasted to reach 53.5% in 2023. Subsequently, the enrollment rate was expected to increase by an average of 3.64 percentage points per year, reaching 79.9% by 2030.

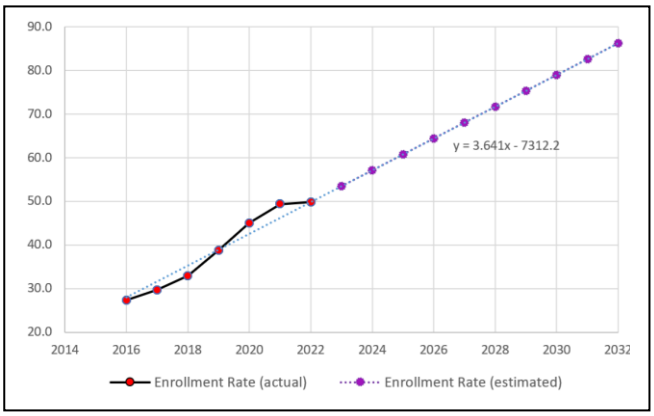

Figure 1: The Trend of the Estimated Enrollment Rate

The loss ratio, which represents the proportion of insurance claims paid relative to the premiums received from policyholders, was not expected to increase continuously in arithmetic terms. Instead, it was anticipated

to fluctuate within a certain range. Therefore, to estimate the appropriate number of loss assessment personnel, a reasonable approach was to analyze the distribution of the loss ratio and apply various scenarios. The distribution of the loss ratio derived from the data used in the analysis is presented in Table 6. The median of the loss ratio was 73.40, and the mean was 89.01. The 25th percentile was 21.16, and the 75th percentile was 123.33.

Table 6: The Distribution of the Loss Ratio

	Loss Ratio								
Percentiles	1	5	10	25	50	75	90	95	99
	5.44	9.62	21.16	41.85	73.40	123.33	157.78	214.64	356.41
Mean	89.01 (72.28, 2.23, 10.79)								

Note: Values in parentheses denote variance, skewness, and kurtosis in order.

Scenarios were established based on trends in enrollment rates and loss ratio percentiles to account for changes in these values. Scenarios were set with enrollment rates of 50%, 60%, and 70%, reflecting recent increases. To ensure that loss assessment duties are conducted smoothly, adequate personnel must be made available to handle periods of high demand. Therefore, scenarios were also created for loss ratios within the distribution, specifically at 100%, 200%, and 300% between the median and the 99th percentile. The estimated number of loss assessment cases based on changes in enrollment rates and loss ratios is shown in Table 7. For all items, the number of loss assessment cases was estimated to be between 1.026 million and 1.936 million cases annually when the enrollment rate was 50%, between 1.377 million and 2.711 million cases at an enrollment rate of 60%, and between 2.013 million and 3.797 million cases at an enrollment rate of 70%.

Table 7: Predictions of Loss Assessment Cases by Changes in Enrollment Rates and Loss Ratios

Categories	Loss Ratio	Annual Number of Loss Assessments		
		ER 50%	ER 60%	ER 70%
Fruits	100	285,240	339,518	559,580
	200	406,342	569,138	797,157
	300	578,860	810,773	1,135,601
Rice	100	266,245	372,914	522,317
	200	379,284	531,239	744,074
	300	540,313	756,784	1,059,980
Other Crops	100	474,756	664,961	931,371
	200	623,756	873,657	1,223,678
	300	816,392	1,143,470	1,601,589
Total	100	1,026,241	1,377,393	2,013,268
	200	1,409,382	1,974,034	2,764,909
	300	1,935,565	2,711,027	3,797,170

Note: ER stands for Enrollment Rates. The unit is incident count.

5.2. Results Estimation of the Required Number of Agricultural Insurance Claims Adjusters

The required number of agricultural insurance claims adjusters can be determined by multiplying the estimated workload by the number of adjusters required per case. First, the appropriate number of working days for loss assessment was calculated. Working days were calculated by multiplying the annual predicted number of loss assessment cases by the inverse of the daily case rate (Table 8).

Table 8: Working Days for Loss Assessment Based on Changes in Enrollment Rate and Loss Ratio

Categories	Cases per Day	Loss Ratio	Working Days for Loss Assessment		
			ER 50%	ER 60%	ER 70%
Fruits	8 cases	LR 100%	35,655	42,440	69,948
		LR 200%	50,793	71,142	99,645
		LR 300%	72,357	101,347	141,950
Rice	15 cases	LR 100%	17,750	24,861	34,821
		LR 200%	25,286	35,416	49,605
		LR 300%	36,021	50,452	70,665
Other Crops	10 cases	LR 100%	47,476	66,496	93,137
		LR 200%	62,376	87,366	122,368
		LR 300%	81,639	114,347	160,159

Note: The unit is number of days that damage assessment was conducted.

The annual number of loss assessment cases was estimated using predictions from the model, whereas the daily case rate was based on standard values used by the loss assessment institutions. According to internal data from the loss assessment institutions, the number of cases handled per day is 8 for fruit crops, 15 for rice, and 10 for other crops. These standard values were used to calculate the appropriate number of working days.

Subsequently, the total budget for survey personnel was calculated by multiplying the number of working days for loss assessment by the daily allowance (400,000 KRW/day). This budget was then divided by the expected annual income of 15 million KRW per person to estimate the number of personnel required for loss assessment based on income levels. The number of personnel required for loss assessment was based on the assumption that only the estimated number of personnel was considered for loss assessment. Specifically, for each case, only one person was assumed to be involved. However, in practice, multiple individuals are involved in loss assessment (see the number of personnel per loss assessment case for each item shown in Table 3). The appropriate number of agricultural insurance claims adjusters was calculated by applying the average number of agricultural insurance claims adjusters required per case to the estimated number of personnel required for loss assessment. The results are also shown in Table 9.

Table 9: Results of Estimating the Required Number of

Agriculture Insurance Claims Adjusters

Categories	AICA per Case	Loss Ratio	Required Assessment Personnel			Optimal Number of AICA		
			ER 50%	ER 60%	ER 70%	ER 50%	ER 60%	ER 70%
Fruits	2.63	100%	713	849	1,399	1,879	2,236	3,686
		200%	1,016	1,423	1,993	2,677	3,749	5,251
		300%	1,447	2,027	2,839	3,813	5,341	7,480
Rice	1.39	100%	355	497	696	495	694	971
		200%	506	708	992	705	988	1,384
		300%	720	1,009	1,413	1,005	1,408	1,971
Other Crops	1.22	100%	950	1,330	1,863	1,163	1,629	2,282
		200%	1,248	1,747	2,447	1,528	2,140	2,998
		300%	1,633	2,287	3,203	2,000	2,801	3,924
Total		100%	2,018	2,676	3,958	3,537	4,559	6,939
		200%	2,770	3,878	5,432	4,910	6,877	9,633
		300%	3,800	5,323	7,455	6,818	9,550	13,375

Note: AICA stands for Agriculture Insurance Claims Adjusters. The units are incident count for the number of incidents and personnel count for the number of loss assessors.

The trend in enrollment rates presented in Figure 1 was used to examine the number of agricultural insurance claims adjusters required annually in response to changes in enrollment rates. The results are shown in Table 10. For 2024, with an anticipated enrollment rate of 57.2%, the required number of agricultural insurance claims adjusters was projected to be between 4,559 and 8,731. This number was further expected to gradually increase annually, reaching 9,411 and 18,156 by 2030. Long-term projections indicated that the required number of agricultural insurance claims adjusters will be between 5,063 and 10,287 for fruits and between 1,335 and 2,712 for rice.

Table 10: The Optimal Workforce Size of Agricultural Insurance Claims Adjusters Over Time

Categories	Loss Ratio	Year (enrollment rate estimate, %)						
		2024 (57.2)	2025 (60.8)	2026 (64.5)	2027 (68.1)	2028 (71.7)	2029 (75.4)	2030 (79.0)
Fruits	100%	2,236	2,745	3,109	3,509	3,960	4,486	5,063
	200%	3,465	3,912	4,429	5,000	5,644	6,393	7,217
	300%	4,936	5,573	6,310	7,124	8,043	9,111	10,287
Rice	100%	694	724	820	925	1,044	1,183	1,335
	200%	913	1,031	1,168	1,318	1,488	1,686	1,903
	300%	1,301	1,469	1,664	1,878	2,121	2,402	2,712
Other Crops	100%	1,629	1,643	1,847	2,086	2,356	2,668	3,013
	200%	1,909	2,156	2,423	2,735	3,089	3,499	3,950
	300%	2,494	2,816	3,165	3,572	4,033	4,568	5,157
Total	100%	4,559	5,112	5,775	6,520	7,360	8,337	9,411
	200%	6,287	7,098	8,019	9,053	10,220	11,577	13,070
	300%	8,731	9,857	11,139	12,575	14,197	16,082	18,156

Note: The units are personnel count for the number of agricultural insurance claims adjusters.

The government is working to expand the pool of certified agricultural insurance claims adjusters. However, to ensure effective staffing strategies and operational efficiency, workforce capacity gaps must be accurately assessed, and expansion efforts should align with the demand for loss assessment. Based on a loss ratio of 200%, the required total number of agricultural insurance claims adjusters is estimated at 13,070. However, as of 2022, considering those who passed the certification in 2021, only 3,938 adjusters could actually participate in investigations (MAFRA, 2023), representing 30.1% of the required total. For the stable operation of agricultural loss assessment and the sustainable maintenance of insurance programs, it appears necessary to sustain the workforce supply to address the gaps identified in the analysis.

6. Conclusion

As crop yields can vary significantly from year to year, the number of agricultural insurance claims adjusters needed for crop disaster insurance can fluctuate annually. To ensure stable loss assessment, a crucial step is to maintain an adequate number of adjusters. Particularly, as conducting timely loss assessments might not be possible in the event of large-scale damage caused by natural disasters, a conservative approach must be adopted in estimating the required number of adjusters.

Agricultural loss assessors might face challenges in being deployed promptly because of their primary job responsibilities. This drawback limits their ability to engage in loss assessments over extended periods. Therefore, securing a sufficient number of specialized agricultural insurance claims adjusters is vital for the stable operation of crop disaster insurance. However, the recent surge in the number of qualified agricultural insurance claims adjusters has led to short-term oversupply. This situation may result in insufficient income for adjusters owing to the limited demand for disaster assessments.

This study estimates the optimal number of agricultural insurance claims adjusters by taking into account the total budget for survey personnel and their expected income. Assuming a continuous increase in enrollment rates, a shortage of adjusters at the current levels is anticipated. The analysis projects that the required number of agricultural insurance claims adjusters will gradually increase, reaching 9,411–18,156 by 2030. These findings indicate the need for strategic workforce expansion planning for agricultural insurance claims adjusters.

This study enhances the stability of crop insurance by proposing the optimal number of agricultural insurance claims adjusters and workforce management strategies. To efficiently manage the adjuster system in the long term, it is

essential to introduce performance-based pay scales and competition among adjusters depending on their experience and capabilities. The Agricultural Policy Insurance and Finance Service should lead the development of a comprehensive workforce management plan for agricultural insurance claims adjusters, which must include a professional certification system and practical training post-certification to enhance the expertise and practical skills of adjusters. These strategies ensure the sustainability of the system and will provide a framework for similar agricultural and environmental conditions across other Asian countries.

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