Project of Capacity Development for the Implementation of Agricultural Insurance

Area Yield Index Insurance Product Design

BAPPENAS
Kementerian Perencanaan Pembangunan Nasional/ Badan Perencanaan Pembangunan Nasional

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SOMPO RISK MANAGEMENT
A Theme Park for Security, Health & Wellbeing

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Climate changes are expected to have adverse impacts on agricultural production. For instance, the production of rice, a major staple in Indonesia, is vulnerable to changes in the onset and length of the wet season influenced by El Niño events which are projected to increase from climate change. Also, rice production is sensitive to temperature changes. Some study estimates that an increase of 1°C could reduce national production by 10%–25%.

The negative impacts of extreme climate conditions on agriculture production will likely increase food prices, and this has a serious implication to food security and poverty in Indonesia. The World Bank study shows that a 100% increase in food prices would increase the number of Indonesians in extreme poverty by more than 25%.

Agriculture insurance is one of the risk management instruments which the Government of Indonesia strategically employs to protect our farmers from climate risks. Law number 19 of the year 2013 on protection and empowerment of farmers stipulates that one of the strategies to protect farmers is through agriculture insurance (Article 7 Clause 2) and that the central and regional governments are obliged to protect farmers in the form of agriculture insurance (article 37 clause 1). Agriculture insurance is also referred as one of the priority projects in the presidential regulation number 18 of the year 2020 on the national medium-term development plan (RPJMN) 2020-2024.

Japan International Cooperation Agency (JICA) is one of our long-standing development partners who has been accompanying the process of developing agriculture insurance in Indonesia. Their support to agriculture insurance in Indonesia started in 2013 as a sub-component of the Project of Capacity Development for Climate Change Strategies and assisted in piloting an indemnity-based insurance product for paddy which is now being rolled out as the paddy farming insurance scheme (AUTP) by the Ministry of Agriculture.

This report is one of the deliverables produced under the subsequent project: Project of Capacity Development for the Implementation of Agriculture Insurance, implemented by the Government of Indonesia led by the Ministry of National Development Planning (BAPPENAS) under the collaboration with JICA. Under the Project, we produced training modules on agriculture insurance which are now integrated into the regular training programs of the Ministry of Agriculture targeting agriculture extension officers nationwide as well as piloted a new product: Area Yield Index Insurance, supplementary to the existing AUTP to increase the protection options for paddy farmers.

While we are still on this long journey, committing ourselves to continue further efforts in the development and improvement of agriculture insurance schemes in Indonesia, it is hoped that the publication of the Project deliverables will also foster the understanding of success and challenges in Indonesian agriculture insurance among those who are interested in joining our journey and further cooperation and collaboration.

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CHAPTER 1
INTRODUCTION OF AREA YIELD INDEX INSURANCE (AYII)

1.1 Basic Concept of AYII

Area Yield Index Insurance (AYII) is area-wise index insurance. The indemnity occurs at Desa (village) average yield rather than individual yield. AYII is generally designed to cover systemic perils such as drought, flood and pest and diseases where most farmers could be affected at the same time across the same Desa. The benchmark yield is established at Desa level based on the historical yield data. The actual yield data obtained through Crop Cutting Experiments (CCEs) is less than the benchmark yield, and then an indemnity is paid for all the insured farmers in the same area regardless of their individual losses.

Since AYII is index-based crop insurance, it has limited adverse selection and moral hazard. In other words, individual farmers' behavior such as sabotage and risk-oriented practices has limited impact on the insurance payout. In addition, AYII could cover almost all natural perils related to yield loss. Furthermore, insurers do not need to carry out loss adjustment survey because the indemnity of AYII is made based on average Desa yield rather than individual yield. For this reason, AYII is expected to reduce administrative cost compared to the indemnity-based traditional crop insurance.

1.2 Comparison between AUTP and AYII

One of the biggest differences between AUTP and AYII is insured unit. Insured unit of AUTP is individual farmland, whereas insured unit of AYII is Desa (village). This means that the indemnity is paid based on individual farmers' loss for AUTP, while the indemnity is paid based on average Desa yield loss. The following are the summary of comparison between AUTP and AYII (Table 1.2.1):

Table 1.2.1 Comparison between AUTP and AYII

	AUTP (Indemnity-based Insurance)	AYII (Index-based Insurance)
Premium rate	3% (as a portfolio rate, applied to all provinces)	2.65%
Expected premium amount	IDR 180,000/hectare /planting season. (Farmers' self-reliance is 20%, or as much as Rp.36,000/hectare/planting season.)	IDR 159,000/hectare /planting season. (Farmers' self-reliance is 20%, or as much as Rp.31,800/ hectare/planting season.)
Risks covered	Flooding, Drought, Pests and diseases	Flooding, Drought, Plant Pest Organisms
Coverage (Sum insured)	The maximum payout amount (coverage level) is 6 million IDR/ha (about 410$), based on an estimated average production cost of paddy per hectare.	The maximum payout amount (coverage level) is 6 million IDR/ha (about 410$), based on an estimated average production cost of paddy per hectare.
Insurance period	MT1: November 1 - March 31 MT2: April 1 – October 31	MT1: November 1 - March 31 MT2: April 1 – October 31

	AUTP (Indemnity-based Insurance)	AYII (Index-based Insurance)
Trigger (Benchmark yield, Threshold)	The current trigger point for an insurance loss is set at over 75% of the insured field (each original slot area) to sustain damage equal to or in excess of 75% of plants (=the intensity of damage was 75%).	The trigger in AYII is "benchmark yield" shown as a percentage of the 7-year historical average yield at the level of Desa. The benchmark yield value is set at 85% of the average yield for Desa.
Loss assessment (Loss survey)	Field loss assessment shall be made individually to check the actual paddy damages (triggered by a percentage damaged plants) to a portion of planted acreage.	One of the field sampling survey methods, Crop Cutting Experiment (CCE), shall be conducted to get the average area-yield.
Basis Risk	The basis risk is much smaller[1] than that of the indexbased ones because of individual loss assessments.	Farmers may incur production losses but do not receive payouts. Basis risk is generally taken into account for index-based insurance products.

Source: JICA Consultant Team

1 Many insurance companies explain that there is no basis risk in indemnity-based insurances.

CHAPTER 2
AREA YIELD INDEX INSURANCE (AYII) DESIGN

2.1 Overview of Product Development Process

Product development lifecycle commences at availability of cleaned and filled yield data and other proxy data such as weather data and satellite data. One of the major challenges in the product development would be reviewing the accuracy of the collected data and validating the datasets with some proxy data.

The following are the basic product development lifecycle:

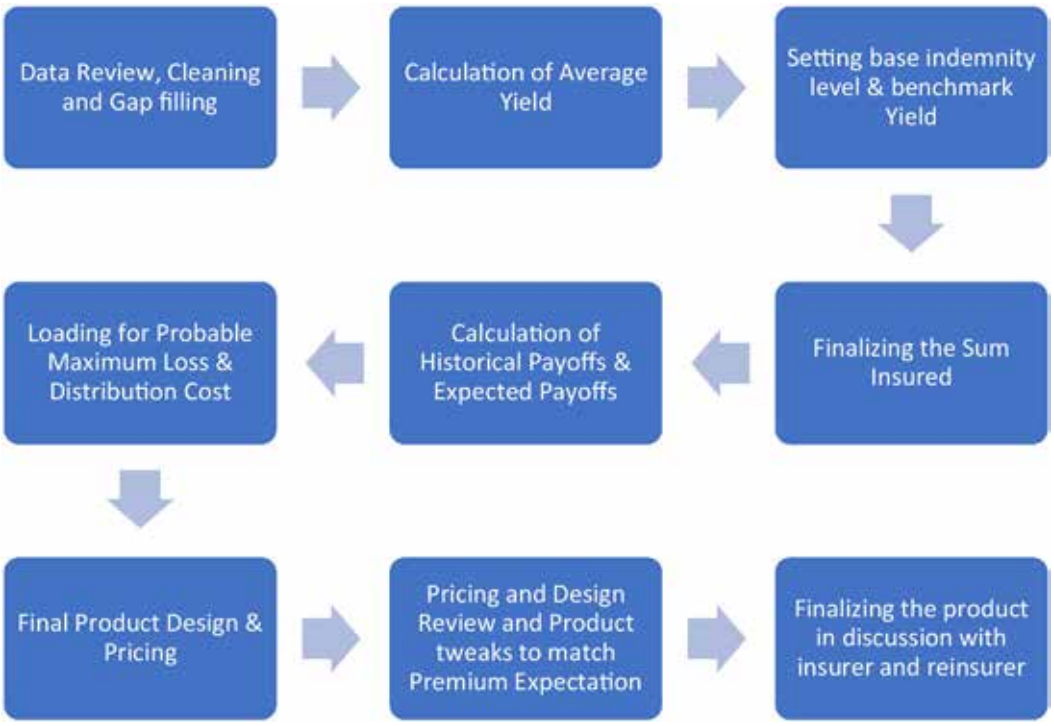

Figure 2.1.1 AYII Product Design Flow

The following are the key considerations for the AYII product development:

1. Level of settlement/granularity:
   a. Farm level/lower or upper administrative level – this settlement level would be decided based on availability of historical datasets. Under the JICA AYII pilot scheme, settlement level was decided at Desa (village) level.
   b. Extent of coverage/notified areas and premium parity required – premium parity would mean that if the premium has to be kept as same at a Kabupaten or Kecamatan level, it would need area sown data at village level to give adequate risk weights.

2. Loss settlement/ loss criteria
    a. Types of risks to be covered (based on study of historical yield, crop risks, weather events, and market data and risk faced).
    b. Loss assessment criteria and loss involved with each criterion – in this case loss assessment criteria are based on the CCEs.
    c. Loss calculation during the season as per the loss type or at the end of season.
    d. Loss to be settled on actual yield from the CCEs or yield estimated using technology.
    e. Experiments to be performed only if there is any calamity or irrespective of the actual crop status.

3. Benchmark Yield
    a. Average yield (recent 5 or 7 years) or average good years yield (best in recent 7 years or recent 5 good years with no calamity)
    b. Level of risk to be covered (70%, 80%, 90% or 100%)

4. Premium, subsidy and applicable tax rates – this would have a bearing on the cost that has to be borne by farmers and thus would also impact the product design and indemnity levels.
    a. Paying capacity of the farmers/affordability
    b. Government support/subsidy
    c. Applicable tax rates
    d. Any caps on premium rates

5. Maximum coverage amount
    a. Cost of cultivation or average income – if farmers income levels have to be covered than appropriate deductibles or monitoring mechanism might be required to ensure that there is no moral hazard risk in the product.
    b. Same or different for Kecamatan or Desa – Extent of product design effort would also depend upon that the sum insured amount is varying from Desa to Desa or it is same for the Kabupaten or Kecamatan as a whole.

6. Insurance Provider
    a. Government
    b. Insurance company
    c. Charitable organizations/ non- government organizations

7. Implementation
    a. Period: season/1 year/ more than 1 year
    b. Voluntary/ compulsory – the program is likely to be credit linked then the offtake of insurance would be higher. Also, possibility of adverse selection in a mandatory / compulsory insurance program is lower and hence can help in underwriting the product.
    c. Distribution channel
        i. Directly to farmers via central agency, local bodies, banks or social network organizations
        ii. Along with inputs (if farm inputs are provided by the government)

2.2 Data Collection for AYII Design

Data collection is key to conduct proper AYII design and pricing. Particularly, yield data and weather data are important for the AYII product development. As for yield data, minimum 10 years of yield data is required for the product design. Also, yield data has to be checked for any anomaly in the recording and punching. The main usage of yield data is to calculate average yield values. In this pilot implementation, the average yield of last (latest) 7 years is calculated by each Desa (village) for the sake of arriving at "benchmark yield".

Weather data includes rainfall, temperature, and wind information. These weather datasets are mainly used for calculating the Probable Maximum Loss (PML) for the drought, floods and pests and diseases events. The following table shows the list of basic data required for the AYII design:

Table 2.2.1 Data Requirements for AYII Design

Data Type	Time Series Duration (Ideal Case)	Data Usage
Area Sown	10 years	To evaluate the risk exposure and estimate portfolio risk concentrations
Yield data for each season	10 years	For development of basic product design and pricing
Data of variety sown with normal yield potential	10 years	For validation of yield data and understanding the possible reasons for the losses
Area Insured in past years of AUTP Program	5 years	For understanding and evaluating the uptake and reasons for variations in the uptake
Premium and Losses (Desa-wise) for past years	5 years	For risk evaluation and causal analysis of the losses
Weather Data including rainfall, temperature and wind information	30 years	To get better understanding of Probable Maximum Loss For evaluating its utility for dispute resolution
Remote Sensing data of NDVI, EVI, VCI or flood or drought extent	10 Years	For validation of yield data and understanding the variation in the data For evaluating its utility for dispute resolution

Source: JICA Consultant Team

2.3 Data Review and Analysis

Yield data at Desa level was obtained from Kabupaten agricultural offices. Historical yield data is available since 2010 till 2020, and some Desas have even longer historical yield data. In Indonesia, BPS is responsible for statistical data including yield data; however, they only have historical yield data at Kabupaten (district) level. Therefore, Kabupaten agricultural offices provided historical yield data at Desa level. The table below shows the summary of the collected historical yield data in Karawang Kabupaten:

Table 2.3.1 Historical Yield Data of Karawang and Kendal Used for the Product Development

No.	Kecamatan (District)	Desa (Village)	Yield Data Period	Kecamatan (District)	Desa (Village)	Yield Data Period
	Karawang			**Kendal**		
1	Kutawaluya	Sindangsari	2012 - 2020	Pageruyung	Surokonto Wetan	2010-2020
2	Kutawaluya	Sindangmukti	2012 - 2020	Pageruyung	Gebangan	2010-2020
3	Kutawaluya	Kutamukti	2012 - 2020	Pageruyung	Surokonto Wetan	2010-2020
4	Pedes	Sungaibuntu	2000 - 2020	Patean	Wirosari	2010-2020
5	Pedes	Payungsari	2000 - 2020	Patean	Pagersari	2010-2020
6	Pedes	Rangdumulya	2000 - 2020	Patean	Selo	2010-2020
7	Cibuaya	Jayamulya	2011 - 2019	Patebon	Wonosari	2010-2020
8	Cibuaya	Kertarahayu	2011 - 2019	Patebon	Pidodowetan	2010-2020
9	Cibuaya	Gebangjaya	2011 - 2019	Patebon	Pidodokulon	2010-2020
10	Telagasari	Pasirkamuning	2010 - 2020	Plantungan	Wadas	2010-2020
11	Telagasari	Kalibuaya	2010 - 2020	Plantungan	Bendosari	2010-2020
12	Telagasari	Cilewo	2010 - 2020	Plantungan	Mojoagung	2010-2020
13	Rawamerta	Sukapura	2012 - 2020	Rowosari	Parakan	2010-2020
14	Rawamerta	Gombongsari	2012 - 2020	Rowosari	Karangsari	2010-2020
15	Rawamerta	Kutawargi	2012 - 2020	Rowosari	Randusari	2010-2020

Source: Karawang and Kendal Kabupaten Agricultural Office

The weather data is also collected through the international organizations and satellite data as follows:

√ Global Climate Observation System data from World Meteorological Organization (WMO)

- Daily data available for all the parameters. There are a total of 15 stations available. Out of 15 stations, 10 stations have more than 20 years of data.
- Most of the data for the stations are completed with few years' gaps. In few stations, significant gaps in data have been observed.
- WMO dataset is available for all the parameters received from weather stations include:
  - Mean Temperature
  - Maximum Temperature
  - Minimum Temperature
  - Precipitation
  - Relative humidity
  - Wind Speed

√ Global Precipitation Measurement (GPM) Data

- Rainfall data was available from the year 2016. Data from 1997 to 2015 is available under other mission of "Tropical Rainfall Measuring Mission (TRMM)" The resolution of this data is 0.1 degrees.

√ European Centre for Medium-Range Weather Forecasts - ERA5 (ECMWF) Weather Data

- Daily data was available for all the parameters of temperature, humidity, wind and rainfall.

Data Deduction and Analysis

» Yield data

The yield data is available almost all the seasons between 2010 and 2020. One of the characteristics of the yield data is that it has similar trend across the Desas within a Kecamatan. The yield data was also available at farming group level for three Kecamatans in Karawang. The yield data at Desa level is only available for the remaining two Kecamatans.

» Weather data

To estimate the extreme flood events, storm rainfall (cumulative five-day rainfall) data have been collected to fit a parametric distribution. This led to the estimation of the one in a 100-year event storm rainfall which comes out at about 250 mm. As regards standing water in the pilot areas, we have estimated the maximum standing water possible which comes to about 0.5 m. With this standing water, loss is estimated to the tice crop at various stages using empirical evidence. The analysis shows that loss to rice crop due to standing water depth of 0.5 m can be 10 - 15% of the sum insured.

2.4 Basic Conditions of AYII

2.4.1 Risk Coverage and Exclusion

The AYII product covers the following risks:

a. Flooding, in this case, is the inundation of agricultural land with a certain depth and period during the period of plant growth, resulting in damage to crops and reducing crop production levels, both floods caused by high rainfall and high tides (Rob).

b. Drought, in this case, is not meeting plants' water needs for a certain period during plant growth, resulting in non-optimal growth rates, damage to plants, and lowered crop production levels.

c. Plant Destruction Organisms (OPT) are organisms that can interfere with and damage plant life or cause plant death, including:

- Plant Pests: Stem Borer, Brown Planthopper, Stinky Planthopper, Rat, Armyworm and Golden snail.
- Plant Diseases: Blast, Brown Spot, Tungro, Stem Rot, Hollow Dwarf, Grass Dwarf/Yellow Dwarf, and Crackle.

However, policy has following exclusions:

1. A fire that occurs intentionally or unintentionally,
2. Theft and/or loss during and after the event which this Insurance Policy covers,
3. Intention of the other party with the knowledge of the Insured, unless it can prove that it happened beyond the control of the Insured,
4. Willful mistake or negligence by the Insured or the Insured's representative,
5. Forest, bush, grass, or peat fires,
6. Explosions of all kinds of explosives,
7. Nuclear reactions including but not limited to nuclear radiation, ionization, fusion, fission, or radioactive pollution, regardless of whether it occurs inside or outside the coverage area of rice farming,
8. Earthquakes, volcanic eruptions, and Tsunamis,

9. Any form of business interruption, financial loss due to market failure, and similar financial losses,
10. The government takes an action in the greater public interest,
11. Causes or risks that are specifically and/or not expressly stated as guaranteed in this InsurancePolicy,
12. Losses that occur after the insured plant is harvested,
13. Losses incurred after the expiration date of this Insurance policy,
14. Consequential losses that occur because of other losses.

2.4.2 Settlement Level

The level of settlement is kept at the Desa (village) level. This is because of the following reasons:

- Availability of historical season and year wise yield at a village level. Historical farm level yields were not available.
- Low variability of yield within a Desa. The variability in farm level yield was estimated using vegetative indices such as Normalized Difference Vegetation Index (NDVI[2]) and Leaf Area Index (LAI[3]).
- The actual yields for the settlement year will be available through the crop cutting experiments done by agricultural extension officers.
- Crop Cutting Experiment Data – Crop Cutting Experiments should be done using standard methodology referring to the method adopted by BPS. The Crop Cutting Experiments should be done during the same period as that of historical data should be taken into consideration.

2.4.3 Indemnity Level

The indemnity level was set up at 85% level. The decision on the indemnity level is based on:

- Premiums (discussed in next section). The premium increases as the indemnity level increases, but with higher indemnity level, the product becomes more attractive for the farmers.
- Hidden volatility in yield as there could be errors in the historical yield data. In order to take this into account, lower indemnity levels were recommended.
- There may be errors in the village level yield data reported in the settlement season. In order to address this risk, lower indemnity levels were recommended in the first season.

2.4.4 Other General Conditions of AYII

It is also important to consider eligibility for insurance to minimize adverse selection. The following are major components of the AYII design:

Eligibility and requirements for insured croplands: eligibility for the insurance is limited to paddy farmers with less than 2 ha. The AYII product is only the agricultural insurance option for farmers in the target 15 Desas in Karawang and the target 12 Desas in Kendal. Farmers are not allowed to join AUTP and AYII insurance scheme at the same time.

2 Normalized Difference Vegetation Index quantifies vegetation by measuring the difference between near-infrared (which vegetation strongly reflects) and red light (which vegetation absorbs). It can be used to analyze remote sensing measurements assessing whether or not the target being observed contains live green vegetation.

3 Leaf Area Index is defined as the total one-sided green leaf are per unit of ground surface. A leaf area index (LAI) expresses the leaf area per unit ground surface area of a plant and is used as an indicator of the growth rate of a plant.

Risk coverage and exceptions on natural disasters: guaranteed risks in the AYII product will be floods, drought, and plant destruction organisms (OPT). These exceptions are prescribed in the policy. Concerning natural disasters, earthquakes, volcanic eruptions, tsunamis, and wild fires were excluded by the clauses of general exceptions and special exceptions.

Insurance period: the insurance period is designed for one planting season, a maximum of 6 months, which starts 30 days after the planting.

Basic mechanism of AYII compensation: The AYII product triggers the payout based on a comparison of the actual yield with benchmark yield for the area. As the image diagram of AYII (Figure 3.2.2) illustrates, the benchmark yield is set at 85% of the average yield for each Desa. If the actual yield is smaller than the benchmark yield value, the payout will be given. The actual yield and the benchmark yield are shown as a percentage of the average yield for a certain period in an insured Desa (an insurance unit) mentioned in the policy.

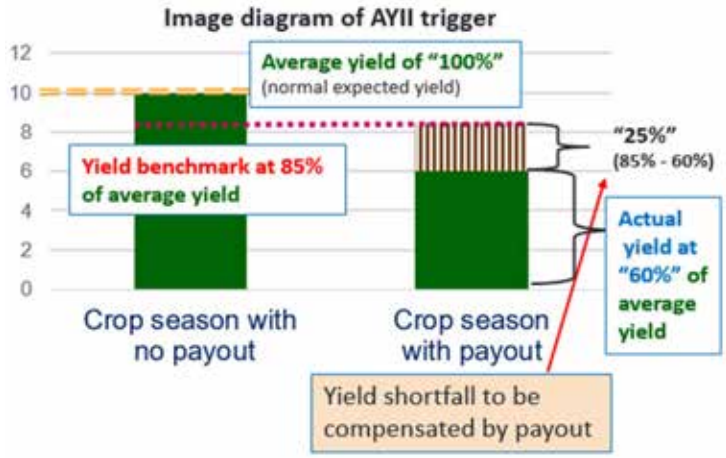

Figure 2.4.1 AYII Trigger Image

Source: JICA Consultant Team

Calculation of compensation in AYII: The calculation of the compensation amount is the ratio on the relation between the benchmark yield and the actual yield, using the following formula:

$$\left[\frac{\textit{benchmark yield - actual yield for the year}}{\textit{benchmark yield}}\right] \textit{ x"sum insured per ha" x "area insured"}$$

It is expected for insured farmers to receive the following amount of compensation. As the sum insured per ha is 6,00,000IDR, if the benchmark yield value is set at 85% of the average yield and the actual yield value amounts to 60%, the result of the compensation amount will be 1,764,705IDR.

$$\left[\frac{85 - 60}{85}\right] x \text{ “6,000,000 } \mathbf{IDR}\text{” } x \text{ “ 1 } \mathbf{hectre}\text{”=1,764,705}\mathbf{IDR}$$

2.5 Premium Calculation

Ratemaking process is a key step of the product design after the determinations of the indemnity level, the level of benchmark yield, the sum insured, calculation of historical payoffs expected payoffs etc. Based on the comprehensive data collection. A pure premium can be defined as loss costs in terms of frequency and severity in pure premium method.

As shown in the following formula, the pure risk premium is calculated through frequency multiplied by severity. Average severity is the amount of loss associated with a payout, and can be a key financial expenditure for an insurer. It is common for insurers to study how often losses (claims) arise. The frequency as probability of occurrence is important for grasping expenses.

Pure risk premium = Frequency × Severity

(Probability of occurrence) × (amount of loss)

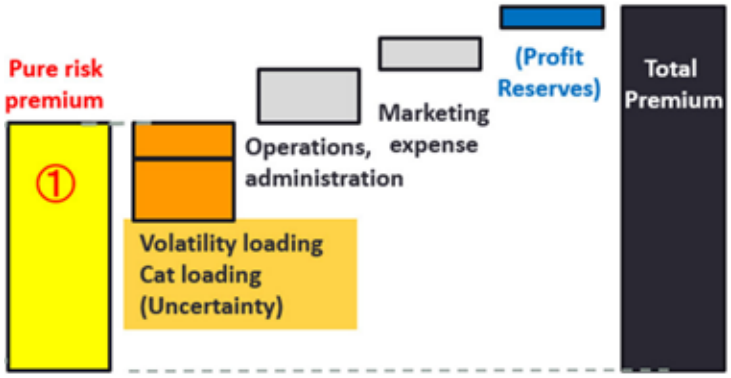

Figure 2.5.1 Pure Risk Premium Calculation

Source: JICA Consultant Team

As seen in Figure 2.5.1 above, the total risk premium is largely composed of pure risk premium, loadings such as volatility loading, catastrophic loading, uncertainty etc., operations and administration, marketing expense, and profit reserves (if we ignore taxes). To briefly grasp the appropriate level of the pure risk premium in proportion to the total premium, loss ratio can be of use. The loss ratio is the ratio of the sum of losses to the total premium, which is significant benchmark for the insured, not only from a management perspective but in this ratemaking process.

In general, the target loss ratio lies within the range between 50% and 80%. In this regard, it is stated that the premium rate of AYII program was previously and tentatively calculated on a basis of 70% target loss ratio[4], and the figure will be one of benchmarks for this pilot implementation. Concerning loadings in the orange boxes in Figure 2.5.1, there are three types of loadings in ratemaking as below.

Pure (expected) risk premium is sum of Expected Loss, Volatility Loading and Catastrophic Loading. All the figures are expressed in terms of percentage of sum insured.

Pure Risk Premium includes (① Expected Loss + ② Volatility Loading + ③ Cat Loading) + α

2.5.1 Expected Loss

In the expected loss (①), the average payout (compensation) of the last 10 years (2011 to 2020, or 2010 to 2019) (or 7 years) was used. The volatility loading (②) is expressed based on loss estimates at various return periods and applying a capital charge on these loss estimates. The catastrophic loading (③) is concerning extreme events which may occur once in 50 years or 1 in 100 years and relevant data was collected. The Project team has taken weather data for past 20 to 30 years from the WMO's Global Observation System for available weather stations in West Java region. "α" represents the other components except the loadings in the pure risk premium.

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Calculation of expected loss (①): expected loss is average claim payout of the last 10 years (2011 to 2020, or 2010 to 2019). This value is shown as percentage of Sum Insured. The following formula will be used to calculate payouts for each year:

Max((Benchmark Yield – Detrended Yield) / (Benchmark Yield), 0) * Sum Insured
① ②

① Benchmark Yield for each Desa is the **de-trended Average Yield of the last 7 years multiplied by level of Indemnity**
② Cleaned data was checked for any trend and the data was adjusted for the trend **using linear detrending**

For de-trending, the Project Team has taken simple linear de-trending to identify and adjust the trend in the yield data. Wherever the yield data was suspect or not available, we have replaced the yield value with conservative yield value from the surrounding Desas to factor in the load on premium due to data inconsistency and/or non-availability.

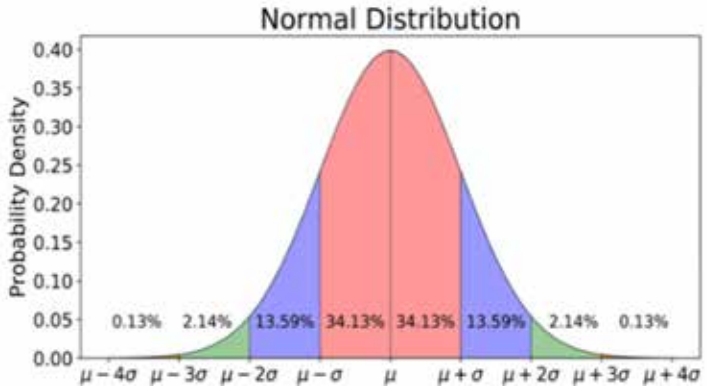

Figure 2.5.2 Distribution of Probability Density

Source: WRMS AYII Product Development Report

2.5.2 Volatility Loading

Volatility loading (②) is based on loss estimates at various return periods and applies a capital charge on these loss estimates. Capital charge is based on available benchmarks but can be modified by the insurer suitably. Capital charge decreases as the return period increases and depends on the capital cost of the insurance company. Capital charge is basically cost of the capital that insurer is setting aside to underwrite this risk. This would depend upon the amount of capital set aside for underwriting this risk by the insurer and return on capital that insurer expects.

Return period of a loss is the inverse of probability (generally expressed in %) of loss, it gives the estimated time interval between events of a similar size or intensity. So, for the estimation of return period of a loss, the probability of the loss is estimated based on a parametric distribution fitted on the 10 to 20-year yield data (see Figure 2.5.2) and using the z-score of the fitted distribution (i.e., normal distribution). It is assumed that the parametric distribution fitted to the yield data can help in calculating losses up to a 50-year return period (i.e., chance of occurrence - 2%). Usually, 20-year data is accepted to estimate losses of a 50-year return period. For higher return periods (50-100%) extreme event analysis has been done.

Table 2.5.1 Return Period of a Loss

Loss	Probability and return period	Loss as % of sum insured	Capital charge	Loading as % of sum insured
Losses between mu + 1.0 sigma	33.14% probability, or 1 in a 3year return period	0.0%	12.5%	0.00%
Losses between mu +1 sigma to mu + 1.5 sigma	10% probability, or 1 in a 10-year return period	4.7%	7.5%	0.35%
Losses between mu + 1.5 sigma to 2.0 sigma	4% probability or 1 in a 25-year return period	9.6%	5.0%	0.48%
Losses between mu + 2 sigma to mu + 2.5 sigma	2% probability or 1 in a 50-year return period	14.5%	2.5%	0.36%
			Total	**1.19%**

Source: WRMS AYII Product Development Report

2.5.3 Catastrophic Loading

Catastrophic loading (③): in this AYII pilot, the Project Team has taken weather data for past 20 to 30 years from the WMO's Global Observation System for available weather stations in the West Java Province. This data has been primarily used for evaluating the catastrophe loading required to account for any adverse event that could have impact on yields in the past and that have not been reflecting in the 10-year yield data available for pricing.

Catastrophic risk loading has been calculated on maximum probable loss scenario which is loss calculation on the basis of modelled events which have return period of 50 to 100 years. These events have been modelled using proxy indicators such as heavy rainfall from weather phenomenon which have higher availability of longer time series data compared to crop yield data. The Consultant Team has also considered the worst case yield scenario from the available yield data we have gotten to reach maximum possible yield loss.

As the project area is irrigated by the cascading dams in the Citarum river, the effect of low rainfall in the Citarum was estimated by correlating past year-wise rainfall data in the Citarum river catchment zone and the water available in the Citarum river. Based on the estimated available river data that can be utilized by the cascading dams i.e., 90%, the consultant team estimated the irrigation water available in the Jatiluhur Irrigation Project Area (2,70,000 ha).

Adding the seasonal rainfall to the water available through the irrigation, it is calculated the shortfall in water available with respect to the ideal water requirement of the Rice crop (1200 mm). Based on the shortfall and the yield sensitivity to water shortage, the consultant team estimate the loss of yield in an extreme year.

Table 2.5.2 Basic Assumption for Probable Maximum Loss Calculation

Field		Value	Unit
Available Flow	Long term average - water availability Citarum and other rivers	7000	Million Cubic meters
	In case of extreme drought (e.g., in 1997 (-42% RF Dep), 2006 (-41% RF Dep))	5500	Million Cubic meters
	In case of 1 in 100 yr. drought event (-75% Dep from Normal RF)	4000	Million Cubic meters

Field		Value	Unit
Utilization (%)	Water Utilization in Normal years	100%	
	Water Utilization in Drought years	100%	
Utilized Flow	Water Utilized for irrigation (90% of available) in normal years	6300	Million Cubic meters
	Water Utilized for irrigation (90%) in drought year	4950	Million Cubic meters
	Water utilized for irrigation (90%) 1 in 100 yr. drought event	3600	Million Cubic meters
Water Available for Crop	Water available in the Rice fields in normal year per season	583.3	mm
	Water available in the Rice fields in drought year	458.3	mm
	Water available in the Rice fields in 1 in 100 yr. drought event	333.3	mm
Crop Water Requirment	Water required during a season for good Rice crop	1200	mm
Water Requirement-Rainfall	Deficit to be fulfilled by rainfall in a normal season (in a normal year, seasonal rainfall is 200 mm)	616.7	mm
	Deficit to be fulfilled by rainfall in a drought year	741.7	mm
	Deficit to be fulfilled by rainfall in 1 in 100 yr. drought event	866.7	mm
Lack of Irrigation	% further drop in yield in extreme years because of lack of irrigation	32%	
Yield Shortfall from potential Yield	Shortfall from Yield potential in Normal Year	28%	% Shortfall
	Shortfall from Yield potential in 1 in 100 yr. drought event	51%	% Shortfall
Yield shortfall from Normal Yield	Probable Maximum shortfall in yield from Normal yield	32%	% Shortfall

Maximum Yield Potential	90	Qt./ha
Normal Year yield	65	Qt./ha
Extreme drought yr. yield (1 in 100-year event)	44	Qt./ha
Yield diff b/w Normal & 1 in 100 yr. drought year	21	Qt./ha
Yield diff b/w Normal & 1 in 100 yr. drought year in % of Normal Yield due to water shortage	32.31%	% Shortfall
Conservative Yield Shortfall in 1 in 100 yr. drought event	40.00%	% Shortfall

Source: WRMS AYII Product Development Report

For estimating extreme flood events, we have collected storm rainfall (cumulative 5 days rainfall) and fitted a parametric distribution. Using this we have estimated the one in a 100-year event storm rainfall which comes out at about 250 mm.

Estimating the standing water in the project areas (after discounting the run off), we have estimated the maximum standing water possible which comes to about 0.5 m. With this standing water, loss is estimated to the rice crop at various stages using empirical evidence (Pls refer charts below). The analysis shows that loss to rice crop due to standing water depth of 0.5 m can be 10-15% of the Sum insured.

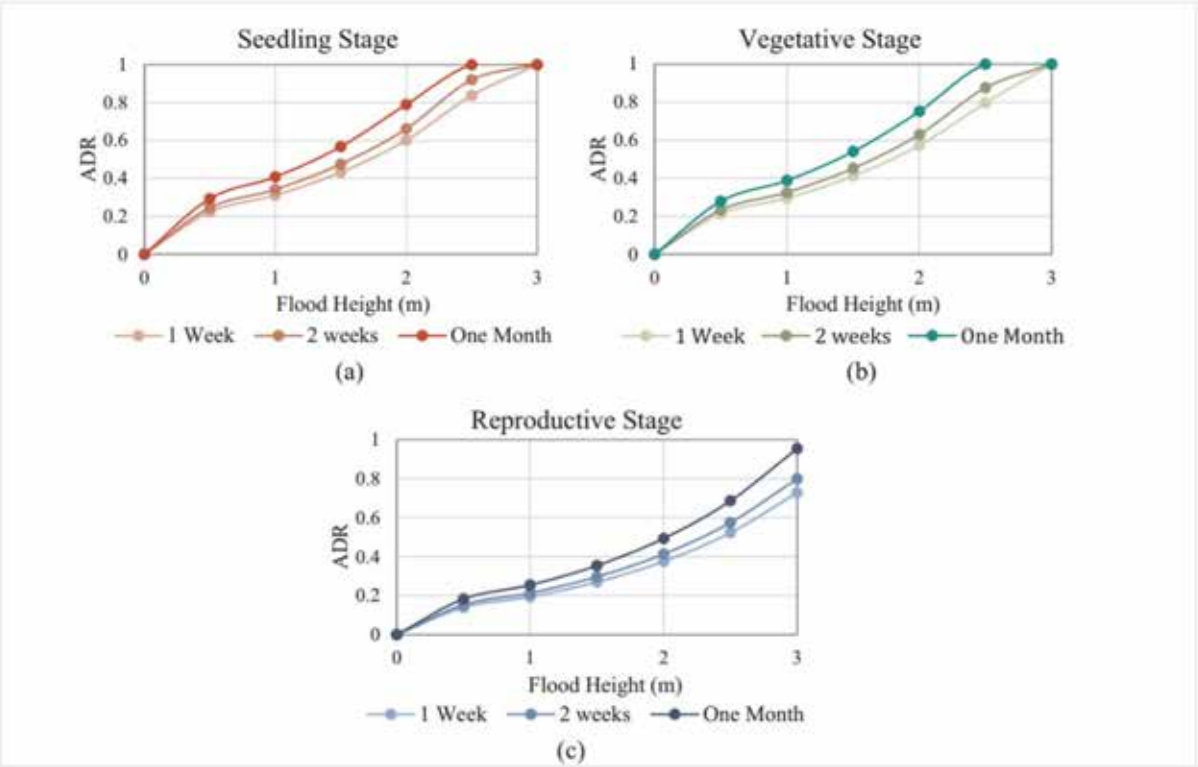

Figure 2.5.3 Agriculture Damage Rate (ADR)

Source: Establishment of flood damage function models: A case study in the Bago River Basin, Myanmar, 2018
Note: Agriculture Damage Rate (ADR) with reference to the flood depth (the depth is defined as height in the above graph) and flood duration for paddy crop

Also, it is seen that during the extreme rainfall seasons, the conditions also become conducive for pest and diseases that attack the Rice Crop e.g., BPH. Using empirical evidence from the South east region of India which has a very similar Rice agro-ecology as West Java, we have estimated worst losses because of BPH, which comes to about 30% of the sum insured and added it to the loss estimate to Rice due to inundation. Using the two analyses, we get a 1 in a 100-year loss of 40% of sum insured. It is applied a capital charge of 2% on this loss to estimate the CAT load but the capital charge can be increased up to 3%.

Based on the above calculations, a couple of values have been calculated:

a. Maximum Probable Loss based on proxy indicators – 40% (32%[5] + safety ratio 8%)

b. Maximum Probable Loss based on the worst case yield outcomes – 36%

The item b. is the assumption of the minimum historical yield of any of the target 15 Desas. 2% of the values of two items above have been taken as loading for catastrophic risks (or extreme events causing high yield losses).

2.5.4 Finalization of the Premium Rate

At first, it is observed if the premium could be varied by Desa, depending on the risk each Desa was facing. Under this AYII project, however, equitable premium (fixed premium) is going to be applied across the 15 pilot Desas mainly from the point of an efficient administrative management.

5 Yield difference between normal & 1 in 100 years worst yield *divided* by normal year yield (%) is *32%. (21Qt./ha / 65Qt./ha)**100

Then, there are some options in how to set the fixed premium across the 15 Desas. One of the reasonable options is weighted average method, estimating the weighted average premium with weights based on the area sown in each Desa. This weighted average method is used for the premium calculation which can provide more equitable premium rate actuarially and address the issue of making the product attractive for Desas with relatively high premium.

However, product would still be more attractive for insured farmers in riskier Desas compared to the ones in Desas with low risk. In this respect, the skew of business towards these riskier Desas and consequent losses to the insurer might be concerned in the long run. If varied rate subsidy is considered to offer in order to induce insured farmers in low risk Desas in buying the product, the issue of the advantages and disadvantages can be handled. In the future, weightage average rates for each Kecamatan may be a good alternative. Rate for each Kecamatan can be calculate using area sown of each Desa as weight. In this process, each Kecamatan would have a different premium rate, but all the Desas of that Kecamatan would have a single premium rate.

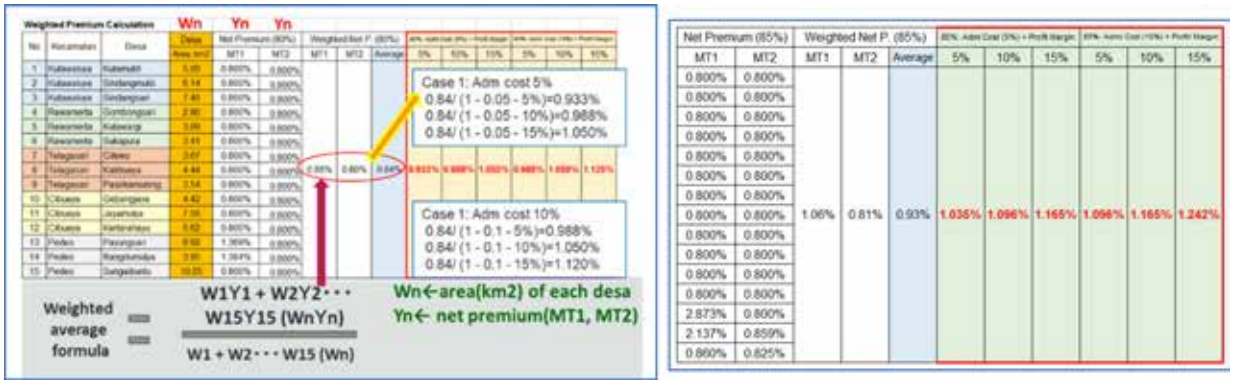

Figure 2.5.4 Calculation Process for Premium Rate

Source: JICA Consultant Team

As shown in the left matrix table about the calculation process of 80% indemnity level (Figure 2.5.4), the insurance premiums using weighted average were calculated from the dataset of "land area in Desa" and "Net Premium" (shown in MT1 and MT2[6]). In this table of indemnity level 80%, the administration cost and profit margin were considered in addition to the weighted net premium of 0.84% as the average value between MT1 and MT2, and we got the tentative value of 1.050%, in the case with 10% administration cost plus 10% profit margin as an example.

Likewise, regarding 85% indemnity level in the right table, we obtained the weighted net premium of 0.93% and the tentative value of 1.165% in the case of 10% administration cost plus 10% profit margin. Those figures were the results from tentative inputs of the administration cost and profit margin. Furthermore, the two tables above (Figure 3.2.5) as the result of the calculation on both MT1 and MT2 should not be directly applied to the pricing of the pilot which may need MT2 premium only. Consequently, the premium rate for the pilot implementation has been fixed 2.65%.

As a breakdown overview, the range of volatility loading (②) was roughly in the range of 0 % to 1.4%, and catastrophic loading (③) was approximately in the range of 0.8% to 1.5%. (The two upper limit values are briefly explained later.) Subsequently, the other elements including safety ratio prepared for uncertainty and marketing expense etc. were also included in the gap between 2.65% (premium rate) and the total value of the two pricing elements (②+③).

6 MT2 means the second paddy season. (MT1 means the first paddy season.)

The yellow bar of pure risk premium (①+②+③) in Figure 3.2.5 contains uncertainty and we can picture that this yellow bar (pure risk premium) would be a variable portion which is affected by the value of uncertainty inside the bar and other elements such as marketing expenses outside the bar. We could set an upper limit figure of volatility loading (②) and catastrophic loading (③) respectively, shown in the followings.

<Two views of the pricing elements; upper limits>

(1) If we take the fact that the yield data does not explain the extreme loss events such as flood or drought into consideration, Catastrophic loading of 1.5 % will be given from the following approach.

- Severity: 30% (Average of historical shortfalls or maximum payout scenarios)
- Frequency: 5% = 2.5 % (Drought: 1 in 40 years) + 2.5 % (Flood: 1 in 40 years)
- Cat Loading: Severity * Frequency = 30% * 5%

(2) Volatility loading of 1.4% may be applied to capture uncertainties around yield variation and low volatility as opposed to actual extreme loss events on the ground.

2.6 Other Aspects of Product Design

2.6.1 Other Terms of Coverage

Following are the other terms of the coverage:

a. No separate coverage for mid-season or localized risks – From the yield data one can infer that the yield volatility is not very significant. Also, it has been observed that the yield shortfall doesn't have a very significant correlation with the extreme weather events in past 10 years. Considering this, the AYII product does not give any payout for mid-season adversity or localized risks.

b. No coverage for prevented sowing – Statistics provided for the area sown have shown consistently similar sown area estimates for all the years. Also, there is no enough available data to do analysis of prevented sowing or sowing failure. Hence, the AYII product does not cover any instances of sowing failure

Assumption on Past Years' Data:

a. It has been assumed that Past years' yield data has been collected following the multi-stage stratified Random Sample and size of sampled plot is 6.25 sq. m.

b. It has been assumed that the yields suggested are of un-milled paddy and not de-husked and milled estimate of rice.

c. It has been assumed that the data provided has been obtained through official sources.

d. It has been assumed that data provided has been collected using a process that is followed consistently for all the years.

e. Crop Cutting Experiment Data – Crop Cutting Experiments should be done using standard methodology referring to the method adopted by BPS. For the purpose of second season for Paddy, Crop Cutting Experiments done during the same period as that of historical data should be taken into consideration.

2.6.2 Premium Rate Setting

One single premium rate was applied for all the targe Desas both in Karawang and Kendal. This is because the single premium rate is easier and more efficient for the insurance operation rather than having different premium rates for each Desa. The single premium rate was calculated by using weighted average based on paddy area in each Desa. This method provides more equitable premium rate actuarially and would address the issue of making the product attractive for Desas with high premium to some extent.

The following table shows different options for setting up a single premium rate. Under the AYII pilot scheme, the weighted average method was applied, yet other options would be considered in the future. These options are mentioned here for your reference purpose:

Table 2.5.3 Options for Single Premium Setting

Method	Description
Maximum of the Premium taken as premium for all Desa	This would be extremely expensive product for the Desa that have better risk profile and more consistent yields over past year. It would result in larger outlay from the government towards the subsidy. In the absence of subsidy, this would result in skewed subscription with only farmers from more risky Desa finding it useful to subscribe for the insurance program.
Average of the Premium taken as premium for all Desa	This would result in increase in premium to be paid by less risky Desa's. Also, this would also result in product for Desas with high risk becoming really attractive. Hence, it is likely to result in much larger offtake of insurance in high risk Desas compared to any other option. This may cause loss to insurance company since total premium received would be less than the actuarial premium.
Weighted Average Premium with weights based on the Area Sown under each Desa	This would provide more equitable premium rate actuarially and would address the issue of making the product really attractive for Desas with high premium to some extent. However, product would still be more attractive for riskier Desas compared to Desas with low risk. Hence, skew of business towards riskier Desas and consequent losses to insurer is likely.
More equitable subsdy-based option	If there is any possibility of offering government subsidy for the program, it would be more prudent to keep the premium rate for each Desas at the actuarial levels. However, for farmers the premium rates can be kept as same. For instance, if two Desas have actuarial premium rates of 2.5% and 4.00% respectively, farmers of both the Desas can be asked to pay 1.5% as premium. Remaining amount would be subsidized by the government.
Kecamatan Level Premium Rate	Another option would be taken weightage average rates for each Kecamatan. Rather than keeping the same rates for all the Desas irrespective of Kecamatans they are in, we can have same rates for each Kecamatan. Rate for each Kecamatan can be calculate using area sown of each Desa as weight.

Source: JICA Consultant Team

2.6.3 Prevented or Failed Sowing Coverage

Prevented or Failed sowing is a situation, where most farmers in the village or the insurance unit area are not able to carry out sowing of the crop on account of factors that are not in their control or where crop that has already been sown hasn't been able to germinate or has perished within specified period of time from sowing. The specified period of time is usually 30 days but may vary depending upon the crop sown.

Percentage of area remaining unsown or failed sowing for the insurance unit to be classified as the case of prevented sowing can be different in different countries or geographies. Crop Insurance provides for early payment of proportionate claims to help farmers take up the cost of re-sowing or sowing a different crop.

Delayed sowing is the situation where the crop has been sown but the sowing has been delayed for substantial portion of the normal sown area of that crop in the insurance unit. Delayed sowing also should happen on account of climate or environmental factors like failure of rainfall, flood or delay in availability of dam water. While delayed sowing may or may not result in crop loss depending upon the crop and the environmental factors.

The AYII pilot scheme addresses these issues as follows:

Prevented sowing – the AYII product does not cover the prevented sowing because of following reasons:

a. Area sown data given to us doesn't suggest any prevented or failed sowing as there is no material reduction in the area sown in any year.

b. Due to lack of very granular and period area sown data for past years, it would be difficult to account for and rate all the possible instances of prevented sowing. This might increase the cost of the insurance solution disproportionate to the actual risk.

c. Area Yield Index Insurance would be offered for the first country and adding more complexity regarding the claims process might be difficult to manage on ground.

Delayed Sowing – Delayed sowing is more likely scenario in the context of Indonesia. Delayed Sowing however can be managed through keep dynamic seasonality discipline. Seasonality discipline for the season can be extended on the basis of following parameters and accordingly cut off dates for buying the crop insurance solution can be reviewed and extended:

a. Delay in Dam water level and likely dates for the release of the water for irrigation

b. Rainfall pattern before the start of the season in comparison to normal rainfall

c. Sowing status monitoring using remote sensing.

2.7 Claim Settlement Process

In AYII, payment of Claim Liabilities is the responsibility of concerned Insurance Company. Since the program doesn't entail settlement of individual farm losses, there can be instances where farmer has lost the crop but he/she is still not eligible for the claims. Considering this, primary responsibility of calculating and settling insurance claims is of Insurance Company. Following steps would be taken for the calculation of claims:

1) Calculation of Actual Yield

a. Actual Yield would be calculated based on the requisite number of Crop Cutting Experiments (CCE) to be conducted.

b. Yield of all these CCE for a specified Insurance Unit Area would be aggregated and statistical mean of the yields of all the CCE in an insurance unit area would be calculated.

This statistical mean is considered as Actual Yield of the Insurance Unit Area.

2) Calculation of per Hectare Claims

If the Actual Yield (AY) of the Insurance Unit Area is less than the Benchmark Yield (BY), then the calculation of claims would be done using the following formula:

$$\frac{Benchmark\ Yield\ of\ Notified\ Insurance\ Unit - Actual\ Yield\ Notified\ Insurance\ Unit}{Benchmark\ Yield\ of\ Notified\ Insurance\ Unit} \times Sum\ Insured\ per\ hectare$$

If AY is less than the benchmark yield of the Insurance Unit Area, all insured farmers growing that crop in that Insurance Unit Area are deemed to have suffered a shortfall of similar magnitude in yield and thus would get same amount of claim per hectare.

3) Calculation of per Farmer Claim

Actual claim payable to each farmer would be calculated using the following formula:

$$Claims\ per\ hectare\ for\ Insurance\ Unit\ \times Area\ Insured\ by\ the\ Farmer$$

Other important points for the claims processing are:

a. In case the insurance is taken by bank providing the farm credit on behalf of the farmer, claims would be paid to the bank for crediting it to the loan account of the farmer.

b. It is important to note that farmer is not required to intimate loss of crop for getting claims under AYII. Farmer is also not required to lodge the any formal claims request for any claims request.

c. Insurance company would do the calculation of claims on the basis of yield data provided by BPS.

APPENDIX I Premium Calculation for Karawang

1) Yield data in Target Desas

			Average Yield (Kt e)																										
KECAMATAN	Desa	Season	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	Trend-R Sq.	Correl	T stat	T test p value	Last data year	Detrend	Slope
Kutawaluya	Kutamukti	I													55	55	55	57	60	60	63	65	65	0.94	0.97	11.345	0.000	2020	Yes	0.63
Kutawaluya	Sindangmukti	I													72	73	72	71	71	70	73	73	74	0.07	0.26	0.763	0.468	2020	No	
Kutawaluya	Sindangsari	I													73	73	72	71	71	71	73	73	74	0.04	0.19	0.555	0.594	2020	No	
Rawamerta	Gombongsari	I													75	77	78	78	78	76	78	78	80	0.44	0.66	2.508	0.036	2020	No	
Rawamerta	Kutawargi	I													73	74	74	74	74	74	74	74	75	0.71	0.84	4.427	0.002	2020	Yes	4.93
Rawamerta	Sukapura	I													77	76	78	78	78	77	79	78	80	0.64	0.80	3.810	0.005	2020	No	
Telagasari	Cilewo	I											70	78	74	77	80	74	77	71	68	75	75	0.02	-0.13	-0.424	0.681	2020	No	
Telagasari	Kalibuaya	I											70	78	74	77	80	74	77	72	71	76	76	0.00	-0.03	-0.105	0.918	2020	No	
Telagasari	Pasirkamuning	I											71	79	76	77	81	76	78	72	70	75	75	0.05	-0.23	-0.754	0.468	2020	No	
Cibuaya	Gebangjaya	I												73	74	74	73	74	74	74	74	74	74	0.51	0.71	3.065	0.013	2020	No	
Cibuaya	Jayamulya	I												74	76	75	76	75	75	75	75	75	75	0.02	0.16	0.479	0.643	2020	No	
Cibuaya	Kertarahayu	I												74	74	74	75	74	74	74	74	75	74	0.25	0.50	1.728	0.118	2020	No	
Pedes	Payungsari	I	72	72	71	70	73	74	72	71	72	72	71	70	70	70	69	69	70	70	70	50	50	0.38	-0.62	-3.524	0.002	2020	No	
Pedes	Rangdumulya	I	56	60	56	58	60	67	65	60	57	61	71	60	65	61	65	66	63	53	65	59	45	0.01	-0.08	-0.365	0.719	2020	No	
Pedes	Sungai Buntu	I	56	59	56		60	67	64	60	57	61	72	60	65	61	65	66	63	64	66	58	55	0.04	0.20	0.912	0.373	2020	No	
Telagasari	Cilewo	I											70	78	74	77	80	74	77	71	68	75	75	0.02	-0.13	-0.423	0.682	2020	No	
Telagasari	Kalibuaya	I											70	78	74	77	80	74	77	72	71	76	76	0.00	-0.03	-0.105	0.918	2020	No	
Telagasari	Pasirkamuning	I											71	79	76	77	81	76	78	72	70	75	75	0.05	-0.23	-0.754	0.468	2020	No	
Kutawaluya	Kutamukti	II													55	55	55	57	60	60	63	65	65	0.94	0.97	11.345	0.000	2020	Yes	0.63
Kutawaluya	Sindangmukti	II													72	73	72	71	71	70	73	73	74	0.07	0.26	0.763	0.468	2020	No	
Kutawaluya	Sindangsari	II													73	73	72	71	71	71	73	73	74	0.04	0.19	0.555	0.594	2020	No	
Rawamerta	Gombongsari	II													77	78	77	77	78	77	78	79		0.25	0.50	1.533	0.169	2019	No	
Rawamerta	Kutawargi	II													74	74	74	74	74	75	74	75		0.82	0.90	5.573	0.001	2019	Yes	5.36
Rawamerta	Sukapura	II													77	77	77	77	77	77	78	79		0.68	0.82	3.847	0.006	2019	No	
Telagasari	Cilewo	II											71	76	74	75	82	77	75	71	76	76		0.03	0.17	0.525	0.612	2019	No	
Telagasari	Kalibuaya	II											70	76	76	76	83	77	75	72	76	76		0.01	0.11	0.317	0.758	2019	No	
Telagasari	Pasirkamuning	II											71	76	75	75	84	78	77	72	78	78		0.07	0.26	0.810	0.439	2019	No	
Cibuaya	Gebangjaya	II												74	74	73	74	74	74	74	74	72		0.18	-0.42	-1.311	0.226	2019	No	
Cibuaya	Jayamulya	II												75	76	76	76	77	76	76	77	76		0.57	0.76	3.284	0.011	2019	No	
Cibuaya	Kertarahayu	II												75	74	74	75	74	75	74	74	76		0.06	0.25	0.724	0.490	2019	No	
Pedes	Payungsari	II	75	75	74	74	77	77	76	74	75	75	74	73	74	73	72	72	73	74	73	70		0.57	-0.75	-4.993	0.000	2019	No	
Pedes	Rangdumulya	II	64	60	60	56	64	64	65	63	66	65	74	65	66	71	75	59	64	66	66	65		0.17	0.41	1.972	0.063	2019	No	
Pedes	Sungai Buntu	II	64	59	60		65	64	65	63	66	65	74	65	66	71	76	59	65	65	65	65		0.10	0.32	1.435	0.168	2019	No	
Telagasari	Cilewo	II											71	76	74	75	82	77	75	71	76	76		0.03	0.17	0.525	0.612	2019	No	
Telagasari	Kalibuaya	II											70	76	76	76	83	77	75	72	76	76		0.01	0.11	0.317	0.758	2019	No	
Telagasari	Pasirkamuning	II											71	76	75	75	84	78	76	72	78	78		0.07	0.26	0.810	0.439	2019	No	

2) Expected Loss in Target Desas

			Loss (in 80%)- Detrended data																					Average Expected Loss			
KECAMATAN	Desa	Season	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	Volatility	80%	85%	90%	95%
Kutawaluya	Kutamukti	I													0%	0%	0%	0%	0%	0%	0%	0%	0%	1.01	0.0%	0.0%	0.0%	0.0%
Kutawaluya	Sindangmukti	I													0%	0%	0%	0%	0%	0%	0%	0%	0%	1.48	0.0%	0.0%	0.0%	0.0%
Kutawaluya	Sindangsari	I													0%	0%	0%	0%	0%	0%	0%	0%	0%	1.37	0.0%	0.0%	0.0%	0.0%
Rawamerta	Gombongsari	I													0%	0%	0%	0%	0%	0%	0%	0%	0%	1.20	0.0%	0.0%	0.0%	0.0%
Rawamerta	Kutawargi	I													0%	0%	0%	0%	0%	0%	0%	0%	0%	0.25	0.0%	0.0%	0.0%	0.0%
Rawamerta	Sukapura	I													0%	0%	0%	0%	0%	0%	0%	0%	0%	1.03	0.0%	0.0%	0.0%	0.0%
Telagasari	Cilewo	I											0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	3.45	0.0%	0.0%	0.0%	0.4%
Telagasari	Kalibuaya	I											0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	3.27	0.0%	0.0%	0.0%	0.1%
Telagasari	Pasirkamuning	I											0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	3.20	0.0%	0.0%	0.0%	0.2%
Cibuaya	Gebangjaya	I												0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0.25	0.0%	0.0%	0.0%	0.0%
Cibuaya	Jayamulya	I												0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0.63	0.0%	0.0%	0.0%	0.0%
Cibuaya	Kertarahayu	I												0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0.34	0.0%	0.0%	0.0%	0.0%
Pedes	Payungsari	I	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	2%	2%	6.44	0.5%	1.6%	2.6%	3.5%
Pedes	Rangdumulya	I	0%	0%	0%	0%	0%	0%	0%	0%	0%			0%	0%	0%	0%	0%	0%	0%	0%	0%	6%	5.41	0.5%	1.0%	1.6%	2.5%
Pedes	Sungai Buntu	I	0%	0%	0%		0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	4.30	0.0%	0.0%	0.2%	1.0%
Telagasari	Cilewo	I											0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	3.44	0.0%	0.0%	0.0%	0.4%
Telagasari	Kalibuaya	I											0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	3.27	0.0%	0.0%	0.0%	0.1%
Telagasari	Pasirkamuning	I											0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	3.20	0.0%	0.0%	0.0%	0.2%
Kutawaluya	Kutamukti	II													0%	0%	0%	0%	0%	0%	0%	0%	0%	1.01	0.0%	0.0%	0.0%	0.0%
Kutawaluya	Sindangmukti	II													0%	0%	0%	0%	0%	0%	0%	0%	0%	1.48	0.0%	0.0%	0.0%	0.0%
Kutawaluya	Sindangsari	II													0%	0%	0%	0%	0%	0%	0%	0%	0%	1.37	0.0%	0.0%	0.0%	0.0%
Rawamerta	Gombongsari	II													0%	0%	0%	0%	0%	0%	0%	0%		0.79	0.0%	0.0%	0.0%	0.0%
Rawamerta	Kutawargi	II													0%	0%	0%	0%	0%	0%	0%	0%		0.18	0.0%	0.0%	0.0%	0.0%
Rawamerta	Sukapura	II													0%	0%	0%	0%	0%	0%	0%	0%		0.78	0.0%	0.0%	0.0%	0.0%
Telagasari	Cilewo	II											0%	0%	0%	0%	0%	0%	0%	0%	0%	0%		3.09	0.0%	0.0%	0.0%	0.4%
Telagasari	Kalibuaya	II											0%	0%	0%	0%	0%	0%	0%	0%	0%	0%		3.37	0.0%	0.0%	0.0%	0.5%
Telagasari	Pasirkamuning	II											0%	0%	0%	0%	0%	0%	0%	0%	0%	0%		3.55	0.0%	0.0%	0.0%	0.6%
Cibuaya	Gebangjaya	II												0%	0%	0%	0%	0%	0%	0%	0%	0%		0.76	0.0%	0.0%	0.0%	0.0%
Cibuaya	Jayamulya	II												0%	0%	0%	0%	0%	0%	0%	0%	0%		0.52	0.0%	0.0%	0.0%	0.1%
Cibuaya	Kertarahayu	II												0%	0%	0%	0%	0%	0%	0%	0%	0%		0.53	0.0%	0.0%	0.0%	0.0%
Pedes	Payungsari	II	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%		1.65	0.0%	0.0%	0.0%	0.0%
Pedes	Rangdumulya	II	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%		4.65	0.0%	0.0%	0.1%	0.7%
Pedes	Sungai Buntu	II	0%	0%	0%		0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%		4.29	0.0%	0.0%	0.2%	0.7%
Telagasari	Cilewo	II											0%	0%	0%	0%	0%	0%	0%	0%	0%	0%		3.09	0.0%	0.0%	0.0%	0.4%
Telagasari	Kalibuaya	II											0%	0%	0%	0%	0%	0%	0%	0%	0%	0%		3.37	0.0%	0.0%	0.0%	0.5%
Telagasari	Pasirkamuning	II											0%	0%	0%	0%	0%	0%	0%	0%	0%	0%		3.55	0.0%	0.0%	0.0%	0.6%

3) Summary of Premium Calculation in Karawang

					80%					85%					90%					95%				
Kecamatan	Desa	Season	Avg Yield (last 10 Years)	Volatility	Benchmark Yield	Expected Loss	Volatility Loading	CAT Loading @2% of PML	Expected Risk Premium	Benchmark Yield	Expected Loss	Volatility Loading	CAT Loading @2% of PML	Expected Risk Premium	Benchmark Yield	Expected Loss	Volatility Loading	CAT Loading @2% of PML	Expected Risk Premium	Benchmark Yield	Expected Loss	Volatility Loading	CAT Loading @2% of PML	Expected Risk Premium
Kutawaluya	Kutamukti	I	65.4	1.0	52.1	0.00%	0.00%	0.80%	0.80%	55.4	0.00%	0.00%	0.80%	0.80%	58.6	0.00%	0.00%	0.80%	0.80%	61.9	0.0%	0.0%	0.80%	0.80%
Kutawaluya	Sindangmukti	I	72.2	1.5	57.6	0.00%	0.00%	0.80%	0.80%	61.2	0.00%	0.00%	0.80%	0.80%	64.8	0.00%	0.00%	0.80%	0.80%	68.4	0.0%	0.0%	0.80%	0.80%
Kutawaluya	Sindangsari	I	72.3	1.4	57.7	0.00%	0.00%	0.80%	0.80%	61.3	0.00%	0.00%	0.80%	0.80%	64.9	0.00%	0.00%	0.80%	0.80%	68.5	0.0%	0.0%	0.80%	0.80%
Rawamerta	Gombongsari	I	77.6	1.2	62.4	0.00%	0.00%	0.80%	0.80%	66.3	0.00%	0.00%	0.80%	0.80%	70.2	0.00%	0.00%	0.80%	0.80%	74.1	0.0%	0.0%	0.80%	0.80%
Rawamerta	Kutawargi	I	74.6	0.3	59.7	0.00%	0.00%	0.80%	0.80%	63.4	0.00%	0.00%	0.80%	0.80%	67.2	0.00%	0.00%	0.80%	0.80%	70.9	0.0%	0.0%	0.80%	0.80%
Rawamerta	Sukapura	I	77.9	1.0	62.6	0.00%	0.00%	0.80%	0.80%	66.5	0.00%	0.00%	0.80%	0.80%	70.4	0.00%	0.00%	0.80%	0.80%	74.3	0.0%	0.0%	0.80%	0.80%
Telagasari	Cilewo	I	74.8	3.5	59.5	0.00%	0.00%	0.80%	0.80%	63.2	0.00%	0.00%	0.80%	0.80%	66.9	0.00%	0.04%	0.80%	0.84%	70.6	0.4%	0.5%	0.80%	1.68%
Telagasari	Kalibuaya	I	75.5	3.3	60.0	0.00%	0.00%	0.80%	0.80%	63.8	0.00%	0.00%	0.80%	0.80%	67.6	0.00%	0.02%	0.80%	0.82%	71.3	0.1%	0.4%	0.80%	1.34%
Telagasari	Pasirkamuning	I	75.8	3.2	60.1	0.00%	0.00%	0.80%	0.80%	63.9	0.00%	0.00%	0.80%	0.80%	67.6	0.00%	0.01%	0.80%	0.81%	71.4	0.2%	0.4%	0.80%	1.37%
Cibuaya	Gebangjaya	I	73.9	0.3	59.2	0.00%	0.00%	0.80%	0.80%	62.9	0.00%	0.00%	0.80%	0.80%	66.6	0.00%	0.00%	0.80%	0.80%	70.3	0.0%	0.0%	0.80%	0.80%
Cibuaya	Jayamulya	I	75.3	0.6	60.3	0.00%	0.00%	0.80%	0.80%	64.1	0.00%	0.00%	0.80%	0.80%	67.8	0.00%	0.00%	0.80%	0.80%	71.6	0.0%	0.0%	0.80%	0.81%
Cibuaya	Kertarahayu	I	74.2	0.3	59.5	0.00%	0.00%	0.80%	0.80%	63.2	0.00%	0.00%	0.80%	0.80%	66.9	0.00%	0.00%	0.80%	0.80%	70.6	0.0%	0.0%	0.80%	0.80%
Pedes	Payungsari	I	65.7	6.4	51.2	0.46%	0.11%	0.80%	1.37%	54.4	1.61%	0.47%	0.80%	2.87%	57.6	2.63%	1.19%	0.80%	4.62%	60.8	3.5%	2.5%	0.80%	6.89%
Pedes	Rangdumulya	I	60.3	5.4	47.7	0.52%	0.06%	0.80%	1.38%	50.7	1.01%	0.33%	0.80%	2.14%	53.6	1.56%	0.97%	0.80%	3.32%	56.6	2.5%	2.2%	0.80%	5.48%
Pedes	Sungai Buntu	I	62.4	4.3	50.0	0.00%	0.00%	0.80%	0.80%	53.1	0.00%	0.06%	0.80%	0.86%	56.2	0.22%	0.40%	0.80%	1.42%	59.4	1.0%	1.4%	0.80%	3.20%
Kutawaluya	Kutamukti	II	65.4	1.0	52.1	0.00%	0.00%	0.80%	0.80%	55.4	0.00%	0.00%	0.80%	0.80%	58.6	0.00%	0.00%	0.80%	0.80%	61.9	0.0%	0.0%	0.80%	0.80%
Kutawaluya	Sindangmukti	II	72.2	1.5	57.6	0.00%	0.00%	0.80%	0.80%	61.2	0.00%	0.00%	0.80%	0.80%	64.8	0.00%	0.00%	0.80%	0.80%	68.4	0.0%	0.0%	0.80%	0.80%
Kutawaluya	Sindangsari	II	72.3	1.4	57.7	0.00%	0.00%	0.80%	0.80%	61.3	0.00%	0.00%	0.80%	0.80%	64.9	0.00%	0.00%	0.80%	0.80%	68.5	0.0%	0.0%	0.80%	0.80%
Rawamerta	Gombongsari	II	77.7	0.8	62.2	0.00%	0.00%	0.80%	0.80%	66.1	0.00%	0.00%	0.80%	0.80%	70.0	0.00%	0.00%	0.80%	0.80%	73.8	0.0%	0.0%	0.80%	0.80%
Rawamerta	Kutawargi	II	74.6	0.2	59.7	0.00%	0.00%	0.80%	0.80%	63.4	0.00%	0.00%	0.80%	0.80%	67.2	0.00%	0.00%	0.80%	0.80%	70.9	0.0%	0.0%	0.80%	0.80%
Rawamerta	Sukapura	II	77.5	0.8	62.0	0.00%	0.00%	0.80%	0.80%	65.9	0.00%	0.00%	0.80%	0.80%	69.8	0.00%	0.00%	0.80%	0.80%	73.7	0.0%	0.0%	0.80%	0.80%
Telagasari	Cilewo	II	75.4	3.1	60.9	0.00%	0.00%	0.80%	0.80%	64.7	0.00%	0.00%	0.80%	0.80%	68.5	0.00%	0.01%	0.80%	0.81%	72.3	0.4%	0.4%	0.80%	1.54%
Telagasari	Kalibuaya	II	75.4	3.4	60.9	0.00%	0.00%	0.80%	0.80%	64.7	0.00%	0.00%	0.80%	0.80%	68.5	0.00%	0.03%	0.80%	0.83%	72.3	0.5%	0.5%	0.80%	1.75%
Telagasari	Pasirkamuning	II	76.2	3.5	61.7	0.00%	0.00%	0.80%	0.80%	65.6	0.00%	0.00%	0.80%	0.80%	69.4	0.00%	0.04%	0.80%	0.84%	73.3	0.6%	0.5%	0.80%	1.89%
Cibuaya	Gebangjaya	II	73.4	0.8	58.6	0.00%	0.00%	0.80%	0.80%	62.3	0.00%	0.00%	0.80%	0.80%	66.0	0.00%	0.00%	0.80%	0.80%	69.6	0.0%	0.0%	0.80%	0.80%
Cibuaya	Jayamulya	II	76.0	0.5	61.0	0.00%	0.00%	0.80%	0.80%	64.8	0.00%	0.00%	0.80%	0.80%	68.6	0.00%	0.00%	0.80%	0.80%	72.4	0.1%	0.0%	0.80%	0.85%
Cibuaya	Kertarahayu	II	74.7	0.5	59.7	0.00%	0.00%	0.80%	0.80%	63.5	0.00%	0.00%	0.80%	0.80%	67.2	0.00%	0.00%	0.80%	0.80%	70.9	0.0%	0.0%	0.80%	0.80%
Pedes	Payungsari	II	72.8	1.6	57.9	0.00%	0.00%	0.80%	0.80%	61.5	0.00%	0.00%	0.80%	0.80%	65.2	0.00%	0.00%	0.80%	0.80%	68.8	0.0%	0.0%	0.80%	0.82%
Pedes	Rangdumulya	II	67.0	4.7	53.3	0.00%	0.00%	0.80%	0.80%	56.6	0.00%	0.06%	0.80%	0.86%	59.9	0.14%	0.41%	0.80%	1.35%	63.3	0.7%	1.4%	0.80%	2.88%
Pedes	Sungai Buntu	II	67.1	4.3	53.3	0.00%	0.00%	0.80%	0.80%	56.6	0.00%	0.02%	0.80%	0.82%	59.9	0.15%	0.29%	0.80%	1.24%	63.2	0.7%	1.2%	0.80%	2.64%

4) Net Premium Rate in Karawang

No	Kecamatan	Desa	Major Varieties			Assumed	Desa	Net Premium (80%)		Net Premium (85%)		Weighted Net P. (80%)			Weighted Net P. (85%)		
			1	2	3	3 Desa Area	Area, km2	MT1	MT2	MT1	MT2	MT1	MT2	Average	MT1	MT2	Average
1	Kutawaluya	Kutamukti	Impari 32	Ciherang		1,375	5.09	0.800%	0.800%	0.800%	0.800%	0.87%	0.80%	0.84%	1.02%	0.81%	0.91%
2	Kutawaluya	Sindangmukti	Ciherang	Impari 32	Mikongga		6.14	0.800%	0.800%	0.800%	0.800%						
3	Kutawaluya	Sindangsari	Impari 32	Ciherang			7.40	0.800%	0.800%	0.800%	0.800%						
4	Rawamerta	Gombongsari	Ciherang	Impari 32		1,154	2.90	0.800%	0.800%	0.800%	0.800%						
5	Rawamerta	Kutawargi	Ciherang	Impari 32	Mikongga		3.09	0.800%	0.800%	0.800%	0.800%						
6	Rawamerta	Sukapura	Ciherang	Impari 32			3.41	0.800%	0.800%	0.800%	0.800%						
7	Telagasari	Cilewo	Ciherang	Impari 32		1,114	3.67	0.800%	0.800%	0.800%	0.800%						
8	Telagasari	Kalibuaya	Impari 32	Ciherang	Mikongga		4.44	0.800%	0.800%	0.800%	0.800%						
9	Telagasari	Pasirkamuning	Ciherang	Mikongga			3.54	0.800%	0.800%	0.800%	0.800%						
10	Cibuaya	Gebangjaya	Ciherang			3,218	4.42	0.800%	0.800%	0.800%	0.800%						
11	Cibuaya	Jayamulya	Ciherang	Impari 32	Mikongga		7.56	0.800%	0.800%	0.800%	0.800%						
12	Cibuaya	Kertarahayu	Ciherang	Impari 32			5.62	0.800%	0.800%	0.800%	0.800%						
13	Pedes	Payungsari	Ciherang	Impari 32	Mikongga	1,650	6.92	1.369%	0.800%	2.873%	0.800%						
14	Pedes	Rangdumulya	Ciherang	Impari 32			3.95	1.384%	0.800%	2.137%	0.859%						
15	Pedes	Sungaibuntu	Ciherang	Impari 32	Mikongga		10.55	0.800%	0.800%	0.860%	0.825%						

APPENDIX II Premium Calculation for Kendal

1) Yield Data in Target Desas

Musim Tanam	Kecamatan	Desa	Jenis Irigasi	Kelompok Tani	Luas (ha)	Varietas	Jadwal Tanam	Jadwal Panen	Produktivitas (Kuintal/ha)										
									2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
I	PAGERUYUNG	Surokonto Wetan	Teknis	Sumber Rejeki	80	IR 64, CILIWUNG, CIHERANG, INPARI 32	Mei	Agustus	64.30	63.00	64.00	63.00	64.00	64.00	64.00	66.00	66.00	65.00	64.00
I	PAGERUYUNG	Surokonto Kulon	Teknis	Sumber Makmur	40	IR 64, CILIWUNG, CIHERANG, INPARI 32	April	Juli	67.00	67.60	63.00	63.00	63.00	67.00	63.00	64.00	63.00	63.00	67.00
I	PAGERUYUNG	Gebangan	Sederhana	Sumber Alam 1	24	IR 64, CILIWUNG, CIHERANG, INPARI 32	April	Juli	54.60	54.00	54.00	54.00	55.00	54.00	55.00	54.00	54.00	54.00	54.00
II	PAGERUYUNG	Surokonto Wetan	Teknis	Sumber Rejeki	80	IR 64, CILIWUNG, CIHERANG, INPARI 32	September	Desember	64.00	64.45	65.00	66.00	65.00	65.00	66.00	67.00	66.00	65.00	66.00
II	PAGERUYUNG	Surokonto Kulon	Teknis	Sumber Makmur	40	IR 64, CILIWUNG, CIHERANG, INPARI 32	Agustus	Nopember	62.00	62.20	64.00	64.00	63.00	63.00	64.00	64.00	63.00	63.00	63.00
II	PAGERUYUNG	Gebangan	Sederhana	Sumber Alam 1	24	IR 64, CILIWUNG, CIHERANG, INPARI 32	Agustus	Nopember	56.00	55.00	56.00	55.00	56.00	56.00	56.00	56.00	56.00	56.00	55.00
I	PATEAN	Wirosari	Sederhana	NGUDIRAHARJO I	60	Ir 64, Ciherang, Merauke, Inpari	Maret / April	Juli / Agustus	53.43	53.00	53.80	54.30	54.80	59.40	50.80	49.00	50.50	52.00	54.00
I	PATEAN	Pagersari	Sederhana	NGUDIRAHARJO II	57	Ir 64, Ciherang, Merauke, Inpari	Maret / April	Juli / Agustus	54.80	53.40	55.00	55.00	55.00	59.70	51.00	49.40	50.60	52.10	54.50
I	PATEAN	Selo	Sederhana	MARGOTIRTOSARI I	68	Ir 64, Ciherang, Merauke, Situbagendit,Inpari	Maret / April	Juli / Agustus	54.30	53.20	54.00	54.60	54.50	59.50	50.90	49.20	50.80	52.10	54.30
II	PATEAN	Wirosari	Sederhana	MEKARSARI	39	Ir 64, Ciherang, Merauke, Inpari	Maret / April	Juli / Agustus	56.50	56.40	56.90	57.30	57.20	61.00	52.30	50.60	52.40	53.40	55.60
II	PATEAN	Pagersari	Sederhana	SUBUR	32	Ir 64, Ciherang, Merauke,Inpari	Maret / April	Juli / Agustus	58.20	56.60	58.10	57.80	57.50	61.50	52.50	51.00	52.50	53.50	55.80
II	PATEAN	Selo	Sederhana	NGUDIRAHARJO I	60	Ir 64, Ciherang, Merauke, Inpari	Agustus/Septem	November/ Des	58.50	56.50	57.30	57.10	57.40	61.30	52.40	50.90	52.50	53.50	55.80
I	PATEBON	Wonosari	Sederhana	NGUDIRAHARJO II	57	Ir 64, Ciherang, Merauke, Inpari	Agustus/Septem	November/ Des	50.14	57.87	57.00	52.82	55.13	50.12	56.32	53.33	56.18	58.08	57.22
I	PATEBON	Pidodowetan	Sederhana	MARGOTIRTOSARI I	69	Ir 64, Ciherang, Situbagendit, Inpari	Agustus/Septem	November/ Des	49.36	58.13	57.26	51.23	54.68	50.18	56.47	52.83	56.18	58.23	56.57
I	PATEBON	Pidodokulon	Sederhana	MEKARSARI	39	Ir 64, Ciherang, Situbagendit, Inpari	Agustus/Septem	November/ Des	50.00	57.16	56.60	51.41	55.08	50.16	56.64	53.41	56.24	58.32	56.62
II	PATEBON	Wonosari	Sederhana	SUBUR	32	Ir 64, Ciherang, Situbagendit, Inpari	Agustus/Septem	November/ Des	50.87	58.36	57.67	52.87	56.58	50.92	57.92	54.53	56.58	59.88	58.07
II	PATEBON	Pidodowetan	Teknis	Sido Mukti, Ngudi Mulyo, Cucut Putih	41.67	Situ bagendit/ IR 64, Inpari 32/ Inpari 33	Mei / juni	Agustus /Septe	51.84	58.93	57.86	53.83	56.48	50.98	57.87	54.43	56.98	59.63	58.17
II	PATEBON	Pidodokulon	Teknis	Karya Tani, Mukti Tani, Karya Makmur	45.67	Situ bagendit/ IR 64, Inpari 32/ Inpari 33	Mei / juni	Agustus /Septe	51.10	59.16	58.00	53.81	56.30	50.96	57.76	54.01	56.16	59.40	58.00
I	PLANTUNGAN	Wadas	setengah teknis	Sari Tani, Dadi Joyo, Sido Makmur	120.77	umbul/lokal, Ciherang, Ciliwung, inpari 32	Okt/Nov 2021	Jan/Feb 2022	55.00	58.00	57.00	53.60	53.60	54.00	54.00	54.00	53.00	53.00	50.00
I	PLANTUNGAN	Bendosari	setengah teknis	Amanah, Tani jaya, Rukun Tani	169.56	umbul/lokal, Ciherang, Ciliwung, inpari 32	Okt/Nov 2021	Jan/Feb 2022	56.00	58.00	58.00	52.30	52.30	63.50	59.40	54.00	53.00	53.00	52.00
I	PLANTUNGAN	Mojoagung	setengah teknis	Makmur Mojoagung, Jaya Abadi	180.60	umbul/lokal, Ciherang, Ciliwung, inpari 32	Okt/Nov 2021	Jan/Feb 2022	59.00	59.00	54.00	53.80	53.80	64.00	60.00	54.00	53.00	54.00	52.00
II	PLANTUNGAN	Wadas	setengah teknis	Sari Tani, Dadi Joyo, Sido Makmur	120.77	umbul/lokal, Ciherang, Ciliwung, inpari 32	Feb/Mar 2022	Mei/Juni 2022	57.00	62.00	59.00	55.00	56.00	66.00	60.00	58.00	59.80	59.80	58.00
II	PLANTUNGAN	Bendosari	setengah teknis	Amanah, Tani jaya, Rukun Tani	169.56	umbul/lokal, Ciherang, Ciliwung, inpari 32	Feb/Mar 2022	Mei/Juni 2022	59.60	62.00	61.00	57.50	57.90	68.00	61.00	58.20	61.00	61.00	56.00
II	PLANTUNGAN	Mojoagung	setengah teknis	Makmur Mojoagung, Jaya Abadi	180.60	umbul/lokal, Ciherang, Ciliwung, inpari 32	Feb/Mar 2022	Mei/Juni 2022	60.40	63.00	58.00	57.00	57.00	68.00	63.00	59.00	59.80	61.00	55.00
I	ROWOSARI	PARAKAN	Tersier	Blimbing, Ngudi makmur 1, ngudi makmur 2	60	Inpari 32, situbangendit, ciherang	november/desember	Maret / April	36.00	41.44	42.40	52.00	53.76	55.68	54.08	50.40	44.64	40.32	42.40
I	ROWOSARI	KARANGSARI	Tersier	Boto Tumpang, tani makmur	90	Inpari 32, situbangendit, ciherang	november/desember	Maret / April	36.48	41.92	42.72	52.48	53.44	54.56	52.96	49.76	43.36	40.00	41.76
I	ROWOSARI	RANDUSARI	Tersier	Guyup Rukun, subur makmur	85	Inpari 32, situbangendit, ciherang	november/desember	Maret / April	36.64	40.80	41.76	52.64	53.28	55.84	53.76	50.08	43.84	39.04	41.76
II	ROWOSARI	PARAKAN	Tersier	Blimbing, Ngudi makmur 1, ngudi makmur 2	60	Inpari 32, situbangendit, ciherang	mei/Juni	Agustus /Septe	76.98	79.68	77.60	56.32	61.12	88.16	65.60	60.00	75.84	88.00	78.08
II	ROWOSARI	KARANGSARI	Tersier	Boto Tumpang, tani makmur	90	Inpari 32, situbangendit, ciherang	mei/Juni	Agustus /Septe	77.60	78.88	78.08	56.64	60.96	89.76	65.92	64.48	77.28	88.00	78.40
II	ROWOSARI	RANDUSARI	Tersier	Guyup Rukun, subur makmur	85	Inpari 32, situbangendit, ciherang	mei/Juni	Agustus /Septe	78.24	79.36	78.56	56.80	60.80	88.64	66.24	64.00	76.32	89.12	78.24

2) Summary of Premium Calculation in Kendal

					80%					85%					90%					95%				
Kecamatan	Desa	Season	Avg Yield (last 10 Years)	Volatility	Benchmark Yield	Expected Loss	Volatility Loading	CAT Loading @2% of PML	Expected Risk Premium	Benchmark Yield	Expected Loss	Volatility Loading	CAT Loading @2% of PML	Expected Risk Premium	Benchmark Yield	Expected Loss	Volatility Loading	CAT Loading @2% of PML	Expected Risk Premium	Benchmark Yield	Expected Loss	Volatility Loading	CAT Loading @2% of PML	Expected Risk Premium
PAGERUYUN	Surokonto Wetan	I	64.2	0.9	51.7	0.00%	0.00%	0.81%	0.81%	54.9	0.00%	0.00%	0.81%	0.81%	58.1	0.00%	0.00%	0.81%	0.81%	61.3	0.0%	0.0%	0.81%	0.81%
PAGERUYUN	Surokonto Kulon	I	62.9	0.6	50.3	0.00%	0.00%	0.81%	0.81%	53.4	0.00%	0.00%	0.81%	0.81%	56.6	0.00%	0.00%	0.81%	0.81%	59.7	0.0%	0.0%	0.81%	0.81%
PAGERUYUN	Gebangan	I	54.2	0.4	43.4	0.00%	0.00%	0.81%	0.81%	46.1	0.00%	0.00%	0.81%	0.81%	48.9	0.00%	0.00%	0.81%	0.81%	51.6	0.0%	0.0%	0.81%	0.81%
PATEAN	Wirosari	I	53.2	2.8	42.3	0.00%	0.00%	0.81%	0.81%	45.0	0.00%	0.00%	0.81%	0.81%	47.6	0.00%	0.10%	0.81%	0.90%	50.3	0.3%	0.7%	0.81%	1.77%
PATEAN	Pagersari	I	53.6	2.8	42.5	0.00%	0.00%	0.81%	0.81%	45.2	0.00%	0.00%	0.81%	0.81%	47.9	0.00%	0.11%	0.81%	0.92%	50.5	0.2%	0.7%	0.81%	1.78%
PATEAN	Selo	I	53.3	2.7	42.4	0.00%	0.00%	0.81%	0.81%	45.1	0.00%	0.00%	0.81%	0.81%	47.7	0.00%	0.08%	0.81%	0.89%	50.4	0.2%	0.7%	0.81%	1.71%
PATEBON	Wonosari	I	55.3	2.9	44.0	0.00%	0.00%	0.81%	0.81%	46.8	0.00%	0.00%	0.81%	0.81%	49.5	0.00%	0.10%	0.81%	0.91%	52.3	0.4%	0.7%	0.81%	1.94%
PATEBON	Pidodowetan	I	55.1	3.2	43.9	0.00%	0.00%	0.81%	0.81%	46.6	0.00%	0.00%	0.81%	0.81%	49.4	0.00%	0.19%	0.81%	1.00%	52.1	0.5%	0.9%	0.81%	2.30%
PATEBON	Pidodokulon	I	55.1	2.9	44.1	0.00%	0.00%	0.81%	0.81%	46.8	0.00%	0.00%	0.81%	0.81%	49.6	0.00%	0.11%	0.81%	0.92%	52.3	0.6%	0.8%	0.81%	2.14%
PLANTUN	Wadas	I	55.0	3.6	43.6	0.00%	0.00%	0.81%	0.81%	46.3	0.00%	0.04%	0.81%	0.85%	49.1	0.00%	0.33%	0.81%	1.13%	51.8	0.3%	1.3%	0.81%	2.43%
PLANTUN	Bendosari	I	55.6	3.7	44.3	0.00%	0.00%	0.81%	0.81%	47.0	0.00%	0.04%	0.81%	0.85%	49.8	0.00%	0.35%	0.81%	1.15%	52.5	0.2%	1.3%	0.81%	2.32%
PLANTUN	Mojoagung	I	55.8	3.8	44.7	0.00%	0.00%	0.81%	0.81%	47.5	0.00%	0.05%	0.81%	0.86%	50.2	0.00%	0.38%	0.81%	1.18%	53.0	0.2%	1.4%	0.81%	2.36%
ROWOSA	PARAKAN	I	47.7	6.7	39.0	0.00%	0.87%	0.81%	1.68%	41.4	0.27%	1.62%	0.81%	2.70%	43.9	2.04%	2.88%	0.81%	5.73%	46.3	4.4%	4.3%	0.81%	9.46%
ROWOSA	KARANGSARI	I	47.3	6.4	38.4	0.00%	0.73%	0.81%	1.53%	40.8	0.19%	1.48%	0.81%	2.48%	43.2	1.46%	2.67%	0.81%	4.94%	45.6	4.0%	4.0%	0.81%	8.83%
ROWOSA	RANDUSARI	I	47.3	6.9	38.6	0.00%	1.00%	0.81%	1.81%	41.0	0.52%	1.75%	0.81%	3.08%	43.4	2.36%	3.07%	0.81%	6.24%	45.8	4.8%	4.4%	0.81%	10.03%
PAGERUYUN	Surokonto Wetan	II	65.4	0.9	52.5	0.00%	0.00%	0.81%	0.81%	55.7	0.00%	0.00%	0.81%	0.81%	59.0	0.00%	0.00%	0.81%	0.81%	62.3	0.0%	0.0%	0.81%	0.81%
PAGERUYUN	Surokonto Kulon	II	63.3	0.7	50.6	0.00%	0.00%	0.81%	0.81%	53.8	0.00%	0.00%	0.81%	0.81%	57.0	0.00%	0.00%	0.81%	0.81%	60.1	0.0%	0.0%	0.81%	0.81%
PAGERUYUN	Gebangan	II	55.7	0.5	44.7	0.00%	0.00%	0.81%	0.81%	47.5	0.00%	0.00%	0.81%	0.81%	50.3	0.00%	0.00%	0.81%	0.81%	53.1	0.0%	0.0%	0.81%	0.81%
PATEAN	Wirosari	II	55.3	3.0	43.7	0.00%	0.00%	0.81%	0.81%	46.4	0.00%	0.00%	0.81%	0.81%	49.2	0.00%	0.12%	0.81%	0.93%	51.9	0.3%	0.8%	0.81%	1.83%
PATEAN	Pagersari	II	55.7	3.2	43.9	0.00%	0.00%	0.81%	0.81%	46.7	0.00%	0.00%	0.81%	0.81%	49.4	0.00%	0.18%	0.81%	0.98%	52.2	0.2%	0.9%	0.81%	1.94%
PATEAN	Selo	II	55.5	3.1	43.9	0.00%	0.00%	0.81%	0.81%	46.6	0.00%	0.00%	0.81%	0.81%	49.3	0.00%	0.16%	0.81%	0.96%	52.1	0.2%	0.9%	0.81%	1.90%
PATEBON	Wonosari	II	56.3	3.1	45.1	0.00%	0.00%	0.81%	0.81%	47.9	0.00%	0.00%	0.81%	0.81%	50.7	0.00%	0.14%	0.81%	0.95%	53.5	0.6%	0.8%	0.81%	2.21%
PATEBON	Pidodowetan	II	56.4	2.9	45.0	0.00%	0.00%	0.81%	0.81%	47.8	0.00%	0.00%	0.81%	0.81%	50.6	0.00%	0.08%	0.81%	0.89%	53.4	0.5%	0.7%	0.81%	1.93%
PATEBON	Pidodokulon	II	56.4	3.0	44.9	0.00%	0.00%	0.81%	0.81%	47.7	0.00%	0.00%	0.81%	0.81%	50.5	0.00%	0.12%	0.81%	0.92%	53.3	0.4%	0.8%	0.81%	2.00%
PLANTUN	Wadas	II	59.4	2.9	47.7	0.00%	0.00%	0.81%	0.81%	50.7	0.00%	0.00%	0.81%	0.81%	53.7	0.00%	0.06%	0.81%	0.87%	56.7	0.3%	0.6%	0.81%	1.73%
PLANTUN	Bendosari	II	60.4	3.1	48.4	0.00%	0.00%	0.81%	0.81%	51.4	0.00%	0.00%	0.81%	0.81%	54.4	0.00%	0.10%	0.81%	0.90%	57.4	0.2%	0.7%	0.81%	1.76%
PLANTUN	Mojoagung	II	60.1	3.6	48.3	0.00%	0.00%	0.81%	0.81%	51.3	0.00%	0.00%	0.81%	0.81%	54.4	0.00%	0.23%	0.81%	1.04%	57.4	0.5%	1.0%	0.81%	2.39%
ROWOSA	PARAKAN	II	73.0	11.0	59.1	0.46%	1.14%	0.81%	2.42%	62.8	1.72%	1.90%	0.81%	4.43%	66.4	3.42%	3.28%	0.81%	7.51%	70.1	5.3%	4.7%	0.81%	10.81%
ROWOSA	KARANGSARI	II	73.8	10.7	60.0	0.56%	1.00%	0.81%	2.36%	63.7	1.55%	1.75%	0.81%	4.10%	67.5	3.25%	3.07%	0.81%	7.12%	71.2	5.2%	4.4%	0.81%	10.43%
ROWOSA	RANDUSARI	II	73.8	10.8	59.8	0.50%	1.02%	0.81%	2.33%	63.6	1.50%	1.77%	0.81%	4.07%	67.3	3.17%	3.10%	0.81%	7.07%	71.0	5.1%	4.5%	0.81%	10.38%

3) Net Premium Rate in Kendal

No	Kecamatan	Desa	MT1	MT2	Net Premium (80%)		Net Premium (85%)		Weighted Net P. (80%)			Weighted Net P. (85%)		
			Area	Area	MT1	MT2	MT1	MT2	MT1	MT2	Average	MT1	MT2	Average
1	PAGERUYUNG	Surokonto Wetan	80	80	0.806%	0.806%	0.806%	0.806%						
2	PAGERUYUNG	Surokonto Kulon	40	40	0.806%	0.806%	0.806%	0.806%						
3	PAGERUYUNG	Gebangan	24	24	0.806%	0.806%	0.806%	0.806%						
4	PATEAN	Wirosari	69	39	0.806%	0.806%	0.806%	0.806%						
5	PATEAN	Pagersari	57	32	0.806%	0.806%	0.806%	0.806%						
6	PATEAN	Selo	68	69	0.806%	0.806%	0.806%	0.806%						
7	PATEBON	Wonosari	57	32	0.806%	0.806%	0.806%	0.806%						
8	PATEBON	Pidodowetan	69	42	0.806%	0.806%	0.806%	0.806%	0.97%	1.14%	1.06%	1.20%	1.52%	1.36%
9	PATEBON	Pidodokulon	39	46	0.806%	0.806%	0.806%	0.806%						
10	PLANTUNGAN	Wadas	121	121	0.806%	0.806%	0.845%	0.806%						
11	PLANTUNGAN	Bendosari	170	170	0.806%	0.806%	0.851%	0.806%						
12	PLANTUNGAN	Mojoagung	181	181	0.806%	0.806%	0.857%	0.808%						
13	ROWOSARI	PARAKAN	60	60	1.676%	2.415%	2.697%	4.434%						
14	ROWOSARI	KARANGSARI	90	90	1.534%	2.365%	2.476%	4.104%						
15	ROWOSARI	RANDUSARI	85	85	1.808%	2.329%	3.082%	4.070%						

No	Kecamatan	Desa	MT1	MT2	MT1	MT2	Net Premium (80%)		Net Premium (85%)		Weighted Net P. (80%)			Weighted Net P. (85%)		
			Area	Area	Area	Area	MT1	MT2	MT1	MT2	MT1	MT2	Average	MT1	MT2	Average
1	PAGERUYUNG	Surokonto Wetan	80	80	8%	9%	0.806%	0.806%	0.806%	0.806%						
2	PAGERUYUNG	Surokonto Kulon	40	40	4%	5%	0.806%	0.806%	0.806%	0.806%						
3	PAGERUYUNG	Gebangan	24	24	2%	3%	0.806%	0.806%	0.806%	0.806%						
4	PATEAN	Wirosari	69	39	7%	4%	0.806%	0.806%	0.806%	0.806%						
5	PATEAN	Pagersari	57	32	6%	4%	0.806%	0.806%	0.806%	0.806%						
6	PATEAN	Selo	68	69	7%	8%	0.806%	0.806%	0.806%	0.806%						
7	PATEBON	Wonosari	57	32	6%	4%	0.806%	0.806%	0.806%	0.806%						
8	PATEBON	Pidodowetan	69	42	7%	5%	0.806%	0.806%	0.806%	0.806%	0.81%	0.81%	0.81%	0.83%	0.81%	0.82%
9	PATEBON	Pidodokulon	39	46	4%	5%	0.806%	0.806%	0.806%	0.806%						
10	PLANTUNGAN	Wadas	121	121	12%	14%	0.806%	0.806%	0.845%	0.806%						
11	PLANTUNGAN	Bendosari	170	170	17%	19%	0.806%	0.806%	0.851%	0.806%						
12	PLANTUNGAN	Mojoagung	181	181	19%	21%	0.806%	0.806%	0.857%	0.808%						
13	ROWOSARI	PARAKAN														
14	ROWOSARI	KARANGSARI														
15	ROWOSARI	RANDUSARI														

The final premium rate for AYII in Karawang is 2.65% per ha. This rate will also be applied in Kendal. However, the net premium of 1.36% is too high to reach the target rate of 2.65% given Jasindo's operational costs. Thus, Jasindo, MOA, and BAPPENAS agreed to exclude Rowosari from the target areas in Kendal during the pilot implementation stage. The weighted average net premium rate than became 0.82% per ha without Rowosari. With Jasindo's operational costs added, the final rate reached 2.65% per ha.

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