Evaluation of Paddy Production Measurement in Indonesia

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Abstract. For many years, paddy production data was obtained from 2 different sources namely harvested area (form monthly report of agricultural statistics; Statistik Pertanian (SP)) and productivity from Ubinan Survey. Both sources need a standard operational procedure (SOP) and an officer to do it. Based on the data, the government states that the paddy production is self-sufficient. However, in fact, the government is still importing the rice. The fact the government still importing the rice is become concerns from researcher. We would like to investigate this issue by doing an in-depth interview involving respective parties. With this method, researcher tries to retrieve an information related to potential sources of bias and measures bias in every step of SP and Ubinan Survey. This bias are allegedly influenced by the implementation of data collection is not in accordance with the SOPs that has been determined. As a result of indepth interview, potential sources of bias in SP are influenced by 50% officers when they are doing the data collection with compilation. The other influence is that 22% - 50% officers are not doing verification into the field after acquiring the harvested area data. Meanwhile, the potential sources of bias in Ubinan Survey indicating that the occurrence of officers whose 5% - 10% doing listing and enumeration not timely and 5% doing replacement of selected paddy farmer/respondent. Both source of potential bias (SP and Ubinan Survey) makes a bias for harvested area of paddy between 12.61% - 20.72% and bias for paddy productivity between 0.23% - 0.25%.

1. Introduction
Quality, continuity of supply and scale of quantity are key factors for farmers to produce food crops that meet consumer demand. By qualified all factors above, the competitiveness of agricultural products will be better. If farmers can not meet the quality, continuity and quantity demanded, then the domestic market will be filled by similar imported products [1].

Total of national paddy production in 2015 reached 75,397,841 tons or equivalent 43.61 million tons of rice. Meanwhile, the amount of rice consumption about 33,368 million tons which made government announced a rice surplus at 10 million tons. However, the government keeps importing, although the value is relatively small at 2.57% of the national rice demand. During the period of 1998-2015 paddy production development tended to increase sharply with an average growth of 2.57% accompanied by the declining trend of rice imports.

The policy of rice import raises questions, because rice production has exceeded rice demand. Import of rice could be causes by various factors such as distribution disturbance, harvest pattern, geographical location and other factors including errors from the production data itself. The production data as a multiplication result of harvested area of paddy from Agricultural Statistics (SP) and per hectare yield (productivity) from Ubinan Survey [1]. This paper was prepared by using an in-
depth interviews of the respective parties in paddy production data collection. The result is information about potential sources of bias and size of bias in various phases of paddy production data collection.

2. Materials and Method

2.1. The Data
In this paper, researcher using primary and secondary data. Secondary data were obtained from regional government/related institutions, namely: Statistics Indonesia (BPS-RI) and Ministry of Agriculture (Kementan-RI). While primary data were obtained by doing an in-depth interview to respective parties involved in monthly SP report and Ubinan Survey.

2.2. Time and Location
This research was conducted in West Java Province Republic of Indonesia at District of Bogor, Cianjur and Karawang form May until July 2017. The time is allocated for collecting, preparing and processing data; and also making a final report.

2.3. Data Analysis
The steps of data analysis were done by using a literature study and an in-depth interviews to respective parties involved in paddy production data collection. This interviews are started from an officer who collect the data in sub-district level until the paddy production data being published by an officer in Provincial level as follow:

- Subdistrict level, such as : Subdistrict Statistics Coordinator; Koordinator Statistik Kecamatan (KSK) and Subdistrict Extension Officer; Petugas Penyuluh Kecamatan (PPK).
- Subject Matter, such as : Chief of Production Statistics Section of BPS District Office, Head of Food Crops Division of District Agriculture Office, Head of Production Statistics Division of BPS of West Java Province, and Head of Food Crops Division of West Java Provincial Agricultural Service.
- Head of Department, such as : Head of BPS District, Head of BPS of West Java Province, Head of District Agricultural Service and Head of West Java Province Agricultural Service. Meanwhile, allocation samples of the interviews as shown in Table 1, i.e.:

| Kind of Respondent          | Bogor District | Cianjur District | Karawang District | Jawa Barat Province |
|-----------------------------|----------------|------------------|-------------------|---------------------|
| KSK (persons)               | 12             | 9                | 9                 |                     |
| KCD (persons)               | 12             | 9                | 9                 |                     |
| Subject Matter (persons)    | 2              | 2                | 2                 |                     |
| Head of Department (persons)| 2              | 2                | 2                 |                     |

In-depth Interviews is the process of obtaining information for research purposes by questioning between the interviewer with the respondent or the person who was interviewed face to face with or without using a guidelines. By in-depth interview, an interviewer and an informant involved in social life is relatively long [2]. An interview is a meeting between two people to exchange information and ideas through the faqs so be constructed meaning in a given topic [3]. An interview is an instrument revising or substantiation of the information that is obtained in advance and a technique of direct communication between researchers and respondents.

According to [4], an in-depth interview is a process of digging up information in depth, open, and free with issue. An in-depth interviews conducted with list of questions that had been prepared in advance. Distinctive features/particularities from an indepth interview is it’s involvement in the life of
a respondents/informant. An in-depth interview digging deep to a topic that has been determined by using an open questions. Excavations to find out their opinions based on perspective of a respondents perceive a problem. Interview techniques performed by an interviewer with interviewing face-to-face.

Uses or benefits from an in-depth interviews are:
1. Discussion topic/problem that asked can be very complex/sensitive.
2. Can dig deeply and fully information about the attitudes, knowledge and respondents views regarding an issue.
3. Respondents are scattered randomly. It’s means that anyone can get an opportunity to be interviewed, but based on the goals and purpose of the research.
4. Respondents can freely answer the questions without any pressure from others or feel ashamed in issuing opinions.
5. The flow of the questions in the interview can use or without using a guidelines. If using a guidelines, the flow of questions that have been made depends on the field needs.

In-depth interview materials depends on the goals and purpose of the interview was held. In order to make these interviews results in accordance with the research objectives, required a skills from an interviewers so that refererence (respondents) can provide an answers that correspond to the questions [5].

The interviews established in order to know in detail the stages of its activities from start to finish in accordance with predetermined standards (SOP). SOP is needed to facilitate, clean up and curb activities of SP and Ubinan Survey. In addition, SOPs will be able to anticipate various situations that may occur in carrying out data collection activities of paddy production. Beside that, SOPs also providing direction for all parties involved and work scope an officers. With this scope clarity, a job description will be clear. So, the clarify able to avoid an overlap that makes an officers performance will be well preserved to produce a qualified paddy production data.

A size of paddy production data quality is known from large of a bias. A qualified production data has the smallest possible bias value. A description of bias potential sources and a magnitude of the bias can be obtained by knowing the quality of the implementation results. Beside that, bias potential sources also known by constraints that faced an officers of SP and Ubinan Survey. A quality as a results of the implementation an activities can be known by several indicators as follows:

a) Performed by a competent officer.

The activities of SP and Ubinan Survey requires a competent officers, field results document inspection, processing and data releases. Competence of an officer’s needed in order to generated an accurately data. Beside accuracy, a data must accordance with the field conditions. An officer’s required to do a job that he is responsible for, and not delegate the work to an incompetent persons. This requires an officers desire and awareness of the importance of the task performed. In addition, a cooperation from all parties involved is requires.

b) Conducted in accordance with a schedule and performed on an appropriate places by using a tools that has been determind.

SP activities are conducted monthly, meanwhile Ubinan Survey are conducted per subround. Both surveys requires an officers to follow a predetermined schedule. All the activities stages of SP and Ubinan Survey have a schedule. These schedules start from the implementation in the field, documents examination as resulting from activities in the field, data processing and data presenting.

Activities implementation of SP and Ubinan Survey is done in a places that should. The implementation start from an officer's visit to a paddy field. This visit was conducted by a SP officers in order to get a total of Paddy field area. As well as SP, an Ubinan Survey officers must visit to the paddy field for an enumeration of Ubinan Survey. Both surveys is finished until the documents of SP and Ubinan Survey were gathered at BPS District for processing. Paddy data collection activities, especially the Ubinan Survey require an officers to use predetermined tile tools. On the other hand, on data processing, BPS District and BPS Province using application with software that has been determined.
c Implementation in accordance with a SOP that has been determined. An activities implementation of SP and Ubinan Survey conducted by an officers in sharing stages has been set a procedure of it’s implementation from beginning to the end. These sharing in accordance with a predetermined standards (SOPs). A SOPs is needed to facilitate, clean up and curb the activities of SP and Ubinan Survey. In addition, SOPs will be able to anticipate various situations that may occur in carrying out paddy production data collections, providing a directions for all parties involved and officers work scope.

With the clarity of this scope, the job description will be clear. This clarity is doing to avoid an overlap, that makes an officer's performance will be well preserved to produce a qualified paddy production data. Among the quality size of paddy production, one of them is the smallest possible bias value.

Large bias of paddy production data can be obtained by:

a. Getting an officers recognition of harvested area in district which became his duty / responsibility.
b. Obtain an officers recognition who in charge at Ubinan Survey about productivity in the region where he / she is responsible.
c. Getting an officers recognition of SP activities at the provincial level about a fixed number (ATAP) of harvested area by district in West Java Province.
d. Getting an officers recognition of Ubinan Survey at the provincial level on a fixed performance figures by district in West Java Province.

All information above is obtained from an in-depth interviews. An in-depth interviews in addition to knowing the potential bias factors, also being done to find large bias of paddy production data. This bias are allegedly influenced by the implementation of data collection is not in accordance with the SOPs that has been determined. To know an occurrence bias of paddy production data is by calculating RB% and RRMSE%. The bias was weighted by using the harvested area as weight. The purpose of paddy production bias measurement is to know the performance result of SP and Ubinan Survey activity.

Following Valaste (2015) who utilized [6] that defines a variance is a square of standard deviation, \( \text{Var} = E[(\hat{\theta} - E(\hat{\theta}))^2] \), while a bias is a difference between a value of the parameter the alleged expectation with j value of an actual parameters, namely: \( \text{Bias}(\hat{\theta}) = E(\hat{\theta}) - \theta \). Total bias squares \( B^2 \) is a combination of several components of the bias can lead to systematic errors, namely: specification bias, \( B_{\text{SPEC}} \); frame bias, \( B_{\text{FR}} \); nonresponse bias, \( B_{\text{NR}} \); measurement bias, \( B_{\text{MEAS}} \); and data processing bias, \( B_{\text{DP}} \).

This component when it is formulated as follows:

\[
B^2 = B_{\text{spec}} + B_{\text{FR}} + B_{\text{NR}} + B_{\text{MEAS}} + B_{\text{DP}}
\]

Mean square error (MSE) is defined as a

\[
\text{MSE} = \text{bias} + \text{variance}^2
\]

MSE is a measure to know the accuracy of an estimator. The square root of MSE is known as the root mean square error (RMSE). A scale to measure performance in this study is Biased Relative Percentage (RB%). RB% is defined as the value of bias expressed in the percentage of real parameters.

The following formula is: \( \text{RB}(\hat{\theta}) \% = \frac{\text{Bias}(\hat{\theta})}{\theta} \times 100\% \)

3. Results and Discussion

3.1. Map The Potential Source Of Bias The Paddy Production Data

The Paddy production data was generated from SP and Ubinan activities containing bias of each stages. Total bias of paddy harvested area is a bias combination of harvested area data in level of sub-district, district and province. These bias make a systematic error of the generated data. The bias of harvested area data are influences by lack of facilities, limited knowledge of an officers, age of an officers who are generally over 40 years old.
Table 2. Activities Description of SP, 2015

| Description                                      | Percentage (%) |
|--------------------------------------------------|----------------|
|                                                  | Bogor | Cianjur | Karawang |
| **1. Collection of Data SP**                     |       |         |         |
| a. Percentage of compilation                     | 66.67 | 66.67   | 66.67   |
| b. Percentage of interviews                      | 33.33 | 33.33   | 33.33   |
| c. Percentage of an officers verify to the field | 77.78 | 50.00   | 66.67   |
| d. Percentage of complete document               | 95    | 90      | 90      |
| e. Percentage of documents piled on time          | 95    | 95      | 95      |
| **2. Sources of Data SP**                        |       |         |         |
| a. Percentage of Village data                    | 33.33 | 41.67   | 33.33   |
| b. Percentage of PPL data                        | 33.33 | 25.00   | 44.44   |
| c. Percentage using farmers group data           | 22.22 | 25.00   | 22.22   |
| d. Percentage uses others data                   | 11:11 | 8.33    | 0       |

Generally, an officers (PPK/KCD) were obtained harvested area data by doing an interview/compilation from a village officer. After data was retrieved, a confirmation into the field needly to be done. A confirmation is doing to find out the data accuracy, but there still some officers didn’t do it. After harvested area data from PPKs accumulated, County Department of Agriculture will verify the completeness and correctness/reasonableness of a SP documents. If they found any incomplete of a SP documents, it’s will be returned to PPKs. PPKs must fixed it, if necessary they must check it into the field. After that, PPKs collected all SP documents to the Department of Agriculture District. So, the Department of Agriculture District will give SP documents to BPS District for data processing.

Table 3. Activities Description of Ubinan Survey for Paddy, 2015

| Description                                      | Percentage (%) |
|--------------------------------------------------|----------------|
|                                                  | Bogor | Cianjur | Karawang |
| **1. Listing of Ubinan**                         |       |         |         |
| a. Percentage of the officers doing the listings by door to door | 90    | 90      | 90      |
| b. Percentage of officers conduct timely listing | 95    | 90      | 90      |
| c. Percentage of a listing fully in the field    | 100   | 100     | 100     |
| d. Percentage of listing document piled on time  | 95    | 90      | 90      |
| e. Percentage of listing contains at least one prospective respondents | 95    | 95      | 100     |
| **2. Enumeration of Ubinan**                     |       |         |         |
| a. Percentage of the officers doing the enumeration | 100   | 100     | 100     |
| b. Percentage of the officers doing the enumeration at harvest | 100   | 100     | 100     |
| c. Percentage of complete enumeration results document Field | 95    | 95      | 95      |
| d. Percentage of document enumeration piled on time | 85    | 95      | 95      |
| e. Percentage of replacement samples             | 5     | 5       | 5       |
| f. Percentage of officers use the ubinan tools   | 100   | 100     | 100     |
| g. Percentage of the officers doing the ubinan along with PPK | 100   | 100     | 100     |

Before inputted a SP documents in to a computer, BPS District conducted an examination of the completeness and stuffing of a SP documents. If there is any incomplete or dubiously a SP document, it will be returned to the Department of Agriculture District for verification. After that, they must repair the document to the fields. After all of the documents had passed through the vetting process,
it’s continued with online process to input the data of SP. So, a SP data will be accessible by BPS Province and BPS-RI, if any data is not make sense/dubiously then BPS Province will verify the reasonableness of data from BPS District. After the completion of the verification harvested area data by the BPS of Province and deemed reasonable, it’s continued by joint verification with Department of Agriculture in Province until harvested area data published.

The current problems arising is decreasing of farmland. Farmland that were used as a places to plant food crops particularly paddy, recently has become a residents, retails or industrial areas. It’s already understood and known by a PKs/KCDs who have been trying to report these changes to the Department of Agriculture. They tries to corrects the total of wetland area which became the basis of calculating harvested area. But, this has been hampered by an existence of a rules/policies that demand a reduced of wetland area attached with a tax invoice and NPWP. It’s difficult for an officers to improve it. Moreover, farmers status in these area mostly just as a tenants not an owners, who at any time could be out of work if the farmland is used by it’s owners.

The process to get a productivity data from Ubinan Survey starts from an events of listing/registration of households by a KSKs. A listing is doing in a BS that has been determined by BPS District. After receiving a BS lists, KSKs will confirm the eligibility of a BS. Therefore, a BS is considered feasible when generating at least one prospective respondent/households who cultivate food crops. When a BS improper, a KSK will report to Head of Production Statistics Section in order to a do BS replacement. An implementation of listing a BS begins after a KSK accepted a Sub-P documents and other supporting documents, namely: Map of ST2013-WB, a BS lists, a cover letter/guidelines listing from BPS District.

On the listing stage required knowledge about the locations of a BSs that will be listed by a KSKs. A KSKs used a BS maps, namely ST2013 WB from BPS District. Generally, KSKs already understand the location of a BS that have become the region of his works. Recently, fast changing of a BS borders influenced by blossoming area at various levels such as RT, RW, environment until villages. A KSKs needly to performs an area search in advance in order to obtain an accurate and up to date BS borders. If there are any changes to a BS boundaries, these changes must be written/illustrated to the maps of ST-2013WB. If there is a dubiously BS borders, supervisor from BPS District will help a KSK by joined checking into the fields.

Causes of biased productivity data as shown in the Table 3 as follow:

1. Listing results different for each district. It’s related to number of a BSs that had been listed, number of listings officers/KSKs, geographical locations of a BSs and a KSKs motivation to complete listing properly and on time.
2. At enumeration due to a plots selection is subjective, production measurement with an Ubinan Survey not in accordance with the prescribed rules, such as : not doing an enumeration in a wetland Paddy, does not do an enumeration at harvest time, incomplete documents, documents collection is not timely, sample replacements, Ubinan tools seems useless and unjoined while doing the ubinan (KSK with PPK).
3. An amount different of productivity bias for each District. It’s related to number of samples that will be enumerated, officers number, geographical locations of the selected samples and motivation from an officers to complete the enumeration with properly and timely.
4. Ubinan Survey that accomplished by BPS and Department of Agriculture per Subround still has shortcomings. It’s shown from an occurrence of a delay in the arrival of documents specifically for Subround 1 (January-April) at Department of Agriculture District received Ubinan Documents (Sub-DS and Sub-S) above January 10, even up to February. This is due to financial years replacement, also caused by an officers (KSKs) that performs the registration/Ubinan Survey Listing and submit the results to the BPS District is not timely.
5. The lack of staff number in each BPS of District coped by workload division made evenly for each officer. Beside that, presences of an officers that had work area in 2 subdistricts made work areas an officers are wider and requires more time to complete his works. Meanwhile, ubinan tools was relatively old and mostly cannot be used. It’s caused by incomplete even it’s already gone. An
ubinan tools availability became an obstacle for an implementation of ubinan enumeration although could be solved by a coordination between a PPKs/KCDs with a KSKs. However, this became a problem for a KSKs to provide times and resources. This problem influenced by a KSKs is not domicile assignments in sub-district but have done absent every day at office of BPS District recently.

3.2. Bias of Paddy Production Data
In 2015, wetland area in Karawang District reached 96.482 hectares, larger than Cianjur and Bogor District that only 40.912 hectares and 65.689 hectares. This affected to the harvested area of paddy in Karawang District reached 184.770 hectares, also exceeded the harvested area of paddy in District of Bogor and Cianjur with 77.801 hectares and 143.363 hectares.

| District  | Harvested Area (Hectare) | Relative Bias |
|-----------|--------------------------|---------------|
|           | Indepth Interview | Published Data |          |
| Bogor     | 56,972                  | 71,864        | 20.72    |
| Cianjur   | 73,230                  | 82,604        | 11.35    |
| Karawang  | 54,023                  | 66,028        | 18.18    |

Comparison between harvested area with wetland area will produce a plant index (indeks Penanaman (IP)). IP of paddy in Cianjur > 2 better than Bogor and Karawang District that still < 2. The difference of this IP caused by extensive paddy which got irrigation, weather, geographical location and the desire of a farmers to do the paddy planting. This affected to bias of paddy harvested area in Bogor district about 20.72%, greater than Cianjur and Karawang with 11.35% and 18.18% as shown in Table 4. After weighting using harvested area of paddy as weighted, it turns that Karawang District contributed bias 8.28%, greater than the District of Bogor and Cianjur which only 3.97% and 4.01%.

| District  | Indepth Interview | Published Data | Relative Bias |
|-----------|-------------------|----------------|---------------|
| Bogor     | 6.342             | 6.326          | 0.25          |
| Cianjur   | 5.955             | 5.941          | 0.24          |
| Karawang  | 6.448             | 6.433          | 0.23          |

From Ubinan Survey, known productivity for each district, as shown in Table 5. It’s demonstrate that biased data is relatively small between 0.23% until 0.25% close to 0. It’s influenced by a productivity numbers that generated by BPS District only using an average of the entire Ubinan Survey results of paddy. Meanwhile, a published productivity data had been weighted by harvested area and number of household/farmer from an Ubinan Survey Listings.

4. Conclusion
Bias of paddy production are influenced by bias of harvested area data and bias of productivity. Harvested area data obtained from SP, the bias influence that 22% until 50% officers are not doing verification into the field after acquiring the harvested area data. Meanwhile, produtivity data obtained form Ubinan Survey, the bias influence by 5% until 10% doing listing and enumeration not timely and 5% doing replacement of selected paddy farmer/respondent. Both source of potential bias (SP and Ubinan Survey) makes a bias for harvested area of paddy between 12.61% - 20.72% and bias for paddy productivity between 0.23% - 0.25%.
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