Operational Risk Analysis at Agribusiness and Technology Park (ATP) IPB, Bogor, Indonesia

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Abstract. ATP IPB is an autonomous business unit under Teaching Farm Sub Directorate of IPB's Business and Entrepreneurship Development Directorate. It produces fruits and vegetables from its own farm and farmers as its partners, and also sells the produce mainly to modern markets. It faces risks in operating its business, especially operational risk. This study aims to: (1) identify ATP operational risk, (2) measure risk based on likelihood and impact, (3) analyze the root causes of ATP operational risk, and (4) provide alternative solutions to the underlying causes. The study was conducted in January to April 2019. Risk level map, risk map, and cause-effect diagram were employed in this study. Results showed three main risks, namely (R1) the output of ATP’s partner did not reach the target, (R2) the output of ATP’s partner exceeded the target, and (R3) the farmer’s production did not reach ATP standard. Risk R2 is included in the low risk level, risks R1 and R3 are included in the extreme risk level. The root causes of the three risks are ineffective penalties, no priority for the screen-house, no priority for increasing the workforce, relationship between supervisor and partner farmers are still transactional. Alternative solutions that can be proposed are participatory assistance, contract review, screen-house implementation, and the formation of farmer groups.

Keywords: Risk Levels, Risk Map, Root Causes

1. Introduction
Agribusiness Development Center (ADC) or currently known as Agribusiness and Technology Park (ATP) is a business unit owned by IPB which is under the Teaching Farm Sub Directorate of Business Development and Entrepreneurship Development of IPB. Formed in 2007, ATP, which was formed because of a collaboration of IPB with the Taiwan Technical Mission in 2007-2014, This collaboration was intended as a means to improve the quality of Indonesian farmers so that their agricultural products can penetrate the domestic and international markets. ATP also acts as a training center for farmer groups in Indonesia, especially for the purpose of increasing income from their commodities, especially those around the IPB location. ATP is located in Cikarawang Village, Dramaga District, Bogor Regency with an area of 10 hectares.

ATP is a business unit that acts as a producer and horticultural trader. As an autonomous unit, ATP is required to be independent in carrying out operational activities, especially those related to the product development process and community and / or farmers assistance in the processing of harvested product. Horticultural products developed at ATP are organic and inorganic vegetable and also fruit products, with 28 of 76 products comes from ATP own property land, while 48 other
products are obtained from partner farmers. Postharvest handling is carried out by ATP in the form of cleaning, sorting, grading, and packing. Post-harvest treatment is carried out to improve the quality of vegetable products to be marketed.

ATP has marketed its products to a number of hotels, restaurants, specialty outlets, organic vegetable communities, resellers, and various Jabodetabek areas in more than 40 modern retailers. In order to meet market demand, ATP production targets are important to always be considered and planned. The ATP production target is formed from the ATP own production target and the production target of partner farmers. The production target of partner farmers has a very large percentage of 73% from the total production target, so the production of partner farmers is very important and can affect business income significantly. Historical purchase order data that can be reviewed in TABLE 1 shows that there is a very high supply demand difference where almost half of the requests cannot be fulfilled by ATP.

| Month    | Demand (kg) | Supply (kg) | Excess (kg) | Percentage of Demand (%) |
|----------|-------------|-------------|-------------|--------------------------|
| January  | 11921       | 7657        | 4264        | 36                       |
| February | 10274       | 4975        | 5299        | 52                       |
| March    | 13122       | 5375        | 7747        | 59                       |
| April    | 11356       | 5921        | 5435        | 48                       |
| May      | 14225       | 6896        | 7329        | 52                       |
| June     | 10526       | 5364        | 5162        | 49                       |
| July     | 12111       | 4525        | 7586        | 63                       |
| August   | 12267       | 6886        | 5381        | 44                       |
| September| 10654       | 5611        | 5043        | 47                       |
| TOTAL    | 106456      | 53210       | 53246       | 50                       |

Source: ATP Primary Data 2018

If it is assumed that the price of partner farmers' products per kilogram sold by ATP to customers is IDR 13,000.00, then from January 2018 to September 2018 it is calculated that ATP has lost an income opportunity of IDR 692,198,000.00. Events that have the possibility to produce losses are included in the risk category (March and Shapira 1987), so an operational risk analysis on ATP needs to be done to reduce the level of risk events that may be encountered in the future.

2. Materials and Methods

2.1 Data Types and Sources

The type of data used in this research are primary data and secondary data. Primary data sources were obtained through in-depth interviews with respondents who had experience and input in the ATP IPB operational process, namely the ATP head, ATP marketing manager, ATP production manager, and ATP partner farmers. Secondary data were obtained in the form of ATP purchase orders, reports on the production results of ATP partner farmers, and other sources related to this research.

2.2 Sampling Technique

Sampling for research carried out intentionally (purposive sampling). The sample was taken with the specific intent and purpose addressed to the respondents to be interviewed in depth. In-depth interviews were conducted with ATP head, ATP production manager, ATP marketing manager, those three respondents were stakeholders and individuals who oversee the implementation of the ATP business. Then the sampling process continued to an interview with key farmers as ATP partners.
The interview was conducted in five stages. The first stage is conducted by conducting in-depth interviews with the head of ATP to get information about the context of company risk and corporate risk tolerance. The second stage was continued with in-depth interviews with the ATP head and ATP production and marketing managers to identify operational risks that could arise. The third stage is an in-depth interview with the head of ATP and the ATP production and marketing manager for risk measurement and mapping by providing a risk assessment based on the likelihood and impact of the risk. The fourth stage carried out in-depth interviews with the ATP Head, production manager and ATP marketing manager to determine the underlying causes. The fifth stage was an in-depth interview with Mr. Putro as ATP partner farmer to validate the underlying causes and add insight to determine the treatment of the underlying causes.

2.3 Data Processing Techniques and Data Analysis

Data processing and analysis is done using qualitative methods based on ISO 31000 risk management, risk mapping diagrams (Ristic 2013), and cause and effect analysis diagrams (Susilo and Kaho 2018).

3. Results

ATP has an operational process to achieve its objectives. The operational process begins with forecasting requests made by the marketing division. The demand forecasts will then will be processed to be an production quota, where the quota is formed every three months and is used as a reference for production targets for ATP’s and partner farmers. Production quotas which are send to partner farmers will be coupled with a collaboration contract between ATP and partner farmers.

Production quotas and contracts that have been received by partner farmers became the rules that must be carried out by farmers in terms of the area of land that must be used to produce agricultural products for ATP and the provisions on the delivery schedule for farmers' harvests. ATP assistants will provide assistance to partner farmers during the process of planting to harvest, assistance is carried out in order to produce the best agricultural products.

Agricultural products produced by farmers from the land mentioned in the contract must be sent to the ATP on a predetermined schedule. Delivery of partner farmers' products begins with delivery in accordance with a predetermined schedule, after arriving at ATP the sorting process will be carried out on the product of partner farmers. The product that do not comply with ATP standards will be returned to partner farmers, except for the issuance of a special policy from ATP. Products that conform to the standard will be packaged and sold to customers. Partner farmers will receive payments based on production in accordance with ATP standards.

3.1 Identification of ATP IPB Operational Risk

The context of risk is something that can affect risk, the context can come from internal and external context. The known internal context is the target production of ATP IPB partner farmers. This context is also the operational target of ATP for income. The known external context is the empowerment of partner farmers. The level of empowerment is calculated from the number of production of partner farmer that reach the ATP standards. The amount of production from partner farmers that reaches the standard determines the success of the ATP mentoring target which is the ATP operational target. Risk tolerance is the value used by ATP to determine what events are considered risks by ATP.

The operational risks identified by ATP operations come from two operational contexts or targets, namely: (1) Production of ATP IPB partner farmers, and (2) Empowerment of partner farmers. The risks identified as Production of ATP IPB partner farmers are that the production did not reach the target and the production exceeded the target. The risks identified as the risk of empowering partner farmers are the products of partner farmers do not achieve ATP standards. The operational risks that have been identified in ATP IPB are presented in TABLE 2.
Table 2. Identification Of Operational Risks In ATP IPB

| Operational Targets | Code | Operational Risk |
|---------------------|------|-----------------|
| Production of ATP IPB Partner Farmers | R1 | The production results of ATP partner farmers did not reach the target |
| Empowerment of Partner Farmers | R2 | The production output of ATP partner farmers exceeded the target |
| | R3 | The production results of partner farmers do not reach ATP standards |

3.2 Measurement of ATP IPB Operational Risk

Operational risks that have been identified through in-depth interviews are then mapped on a risk level map based on AS/NZS ISO 31000 in 2009. The assessment of the likelihood and impact of each risk is based on historical ATP data and the opinions of ATP head, ATP marketing division manager, and ATP production division manager.

The percentage of unachieved production target of partner farmers was reaching 66%. The percentage of production failure can be referred to in TABLE 3.

Table 3. Production targets for ATP partner farmers in January-September 2018

| Month   | Production Target of Farmer | Partner | Target of Target | Not Achieved | Achieved |
|---------|-----------------------------|---------|------------------|--------------|----------|
|         | (kg)                        | (kg)    | (kg)             | (%)          | (%)      |
| January | 19130                       | 8611    | 10519            | 55           |          |
| February| 19130                       | 6616    | 12514            | 65           |          |
| March   | 19130                       | 6084    | 13046            | 68           |          |
Impact Possibility

1 2 3 4 5
R
5 1 R
4 3
3
2
1
R2

R1: The production of ATP partner farmers did not reach the target
R2: The production output of ATP partner farmers exceeds the target
R3: Partner farmers’ production is not transparent to ATP standards

Source: 2018 ATP Primary Data

Figure 1. Map of the operational risk level of ATP IPB

Based on the results of in-depth interviews, the production of partner farmers that exceeded the production target only occurred at certain times such as the dry season. Production of ATP partner farmers that did not reach the standard was 22% of the total production. The percentage of products that reach the standard can be referred to in TABLE 4.

Table 4. Production of partner farmers in January-September 2018

| Month   | Gross Production (kg) | Cleaner Production (kg) | Apkir Products (kg) | Approval (%) |
|---------|-----------------------|-------------------------|---------------------|--------------|
| January | 10614                 | 8611                    | 2003                | 19           |
| February| 8208                  | 6616                    | 1592                | 19           |
| March   | 7402                  | 6084                    | 1317                | 18           |
| April   | 9016                  | 6861                    | 2155                | 24           |
| May     | 7926                  | 6211                    | 1715                | 22           |
| June    | 4511                  | 3440                    | 1071                | 24           |
| July    | 7930                  | 6163                    | 1767                | 22           |
| August  | 9603                  | 7384                    | 2219                | 23           |
| September | 8001                | 6039                    | 1962                | 25           |
| TOTAL   | 73211                 | 57410                   | 15801               | 22           |

Source: 2018 ATP Primary Data

Operational risks at ATP IPB are mapped in four levels, which is low risk, medium risk, high risk, and extreme risk. Three operational risks that have been identified fall into two levels of risk, namely low risk and extreme risk. The risk of the production result of ATP partner farmers exceeding the target is a risk classified as low risk. The risk of farmers’ ATP partner production results do not reach the target and the production results of partner farmers not reaching the
standard is a risk classified as extreme risk. Map of the operational risk level of ATP IPB and the risk map diagram is presented in Figure 1 Figure 2 respectively.

Risks that have been mapped in the risk level map are then grouped in quadrants in the risk map. Two operational risks identified in ATP namely R1 and R3 are included in quadrant 1 which means that both risks are risks that threaten the achievement of company or organizational goals. One operational risk identified in ATP which is R2 is included in quadrant IV, so that risk is a harmless risk. Quadrant mapping results show that there is only one operational risk that has been handled well through efforts to resolve the problems that have been made by ATP IPB and there are two operational risks that are still a threat to ATP in achieving its objectives. ATP needs to know the causes of the basic problems of these risks. Without resolving the underlying cause, new risk arises and the level of risk will arise. Cause and effect analysis are needed to find out all the causes of existing and future risks.

![Figure 2. ATP IPB operational risk map](image)

**3.3 Analysis of Causes and Effects of Operational Risk ATP IPB**

Cause-and-effect analysis diagrams are used to find the causes of operational risks of ATP IPB. Three risks determined by the underlying cause are the production results of ATP partner farmers not reaching the target, the production results of ATP partner farmers exceeding the target, and the production results of partner farmers do not reach ATP standards. Influencing factors are not always the same for every risk.

![Figure 3. Diagram of cause and effect analysis on R1](image)
The cause-and-effect diagram in R1 shows that the main factors that are the source of these risks are human, partner, technology and environmental factors. Method factors are not a source of risk for R1. Each factor has an initial cause in which other causes emerge. The last cause is the basic cause of these factors. R1 risk causal diagram can be seen in Figure 3.

![Diagram of cause and effect analysis in R1](image)

**Figure 4.** Diagram of cause and effect analysis in R2

Diagram causation R2 has fewer factors than the factor R1. Factors that are the source of the causes of this risk are human factors and partner factors. Method, technology, and environmental factors are not a source of risk R2. Each factor has a first cause in which other causes arise. The last cause is the basic causes of these factors. The causal diagram of risk R2 can be seen in Figure 4.

![Diagram of cause and effect analysis on R3](image)

**Figure 5.** Diagram of cause and effect analysis on R3
Risk in R3 has three main factors which are the source of causes, namely humans, technology, and the environment. Method and partner factors are not a source of risk for R3. Each factor has an initial cause in which other causes arise. The last cause is the basic causes of these factors.

3.4 Alternative Operational Risk Solutions for ATP IPB

The basic root causes derived from operational risk of ATP are (1) ineffective punishment on partner factors, (2) no priority for the addition of companions, companion and farmer relationships that are still transactional on human factors, lastly (3) no priority for screenhouse on technological and environmental factors. A list of alternative solutions to resolve the underlying causes of risk can be seen in Table 5.

| Table 5. Alternative operational risk solutions for ATP IPB |
|----------------------------------------------------------|
| **Factor**      | **Basic Causes**                                                                 | **Alternative Solutions** |
| Partner        | Ineffective punishment                                                        | • Participatory assistance |
|                | • There is no priority for the addition of a companion                        | • Contract review         |
| Human          | • Relationship between facilitators and farmers who are still transactional    | • Participatory assistance |
|                |                                                                             | • Formation of farmer     |
|                |                                                                             | • Groups                  |
| Technology     | There are no priorities for the screenhouse                                    | • Participatory assistance |
|                |                                                                             | • Planning for            |
| Environment    |                                                                             | • Implementing a simple   |
|                |                                                                             | • Screenhouse              |
|                |                                                                             | • Formation of farmer     |
|                |                                                                             | • Groups                  |

Participatory assistance is an alternative solution in resolving the underlying causes of ATP. To be able to carry out participatory assistance requires a counselor figure who: (1) is able to become a close partner for farmers; (2) able to facilitate and arouse farmers’ thinking process; (3) always or mostly present for the farmers; (4) respect farmers as equals; (5) not presenting themselves in front of farmers, (6) always collaborating with farmers; (7) always develop horizontal dialogue with farmers (dialogic communication) rather than direct communication as subordinate or teacher-student (monological communication); and (8) not patronizing farmers. This assistance is able to improve partner relationships, increase knowledge and enhance insights, develop a framework of thought based on the knowledge they have, develop various alternative solutions to problems, decide on problem solving actions they face, raise funds independently, conduct monitoring and evaluation, and carry out the exchange process information (Padmowihardjo 2006).
Ineffective penalties for farmers can be resolved if the facilitator has the ability to communicate in appropriate language to partner farmers. Appropriate language in providing an understanding of the importance of contracts with ATP is able to encourage partner farmers to undergo contracts in full. Participatory assistance requires the facilitator to have appropriate language skills to the farmer so that he can resolve the basic causes of ineffective punishment. Thus, participatory assistance, if carried out maximally, can resolve the basic causes of ineffective punishment by partner farmers. A contract review with a more binding form of punishment is an alternative to the basic cause of ineffective punishment by partner farmers. The sanction currently applied if the partner farmer breaches the contract is the termination of the partnership, where the cooperation can still be re-established. Reviewing the contract by applying the consequences in the form of fines makes the farmers have a greater loss if they do not undergo the contract. According to the results of interviews with farmers, the greater consequences if not accompanied by more intensive and friendly assistance can have a negative impact on the productivity of partner farmers.

The basic cause of the lack of priority for the addition of facilitators as well as the transactional relationship between partners and farmers on the human factor is handled with farmer groups and participatory assistance. Farmer groups reduce the number of single farmers, making it easier for facilitators to provide assistance without increasing the number of assistants. However, the existing facilitator must be a qualified companion for participatory assistance so as to resolve this underlying cause and benefit from participatory assistance.

The application of screen houses on a regular basis starts from the use of simple screen houses on a small scale, with financing coming from special financial budget funds planned in the company's annual budget plan. The use of screenhouse itself can increase land production per m2 in a month by 60% based on the difference in ATP land production using screenhouse technology and partner farmers' land that does not use screenhouse technology. If in 2018 ATP partner farmers produce 59 tons of agricultural products and lose 148 tons of demand opportunities, then using a screenhouse can increase partner farmers' production to 94 tons and reduce the loss of demand opportunities to 112 tons.

Another alternative treatment in the form of forming farmer groups consisting of ATP partner farmers is also able to resolve the underlying causes of ATP operational risk. Most ATP partner farmers are single farmers who are not included in the farmer group. According to the primary data of ATP partner farmers, it can be seen that there are some farmers who have a good number of production and their quality of the harvest are above average. In farmer groups, farmers who have above average values can share their knowledge to farmers who have below average values. Farmer groups can help ATP partner farmers in increasing knowledge and information through exchanges between members of farmer groups like the functions of farmer groups namely a place for learning and working together (RI 2016).

The basic cause of technological and environmental factors is the absence of priorities for screenhouses resolved by the formation of farmer groups as non-formal organizations. Farmer groups make it easy for partner farmers to raise capital to make a screenhouse. The role of the participatory assistance from ATP is to assist farmer groups in obtaining capital through the provision of information that can be used as a means to raise funds or get capital.

4. References
[1] March JG, Shapira Z. 1987. Managerial Perspectives on Risk and Risk Taking. Management Science 33: 1404-1418.
[2] Padmowihardjo S. 2006. Penyuluhan Pendampingan Partisipatif. Jurnal Penyuluhan. 2(1):63-64.
[3] [RI]. Menteri Pertanian Republik Indonesia. 2016. Peraturan Menteri Pertanian Republik Indonesia Nomor 67 Tentang Pembinaan Kelembagaan Petani. Jakarta (ID): Republik Indonesia.
[4] Ristic D. 2013. A Tool for Risk Assessment [ulasan]. Safety Engineering. 3(3):121-127.
[5] Susilo LJ, Kaho VR. 2018. Manajemen Risiko Berbasis ISO 31000: 2018: Panduan untuk Risk Leaders dan Risk Practitioners. Jakarta (ID): Gramedia Widiasarana Indonesia.