Handling priority issues in the potato value chain to increase farmers income

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Abstract. The potato commodity value chain actors need additional activities to create added value and open employment opportunities. The study aims to (1) Identify a map of the potato value chain and (2) to analyze problems that cause harm to the main potato value chain actors and how to deal the problem. The study was conducted in South Sulawesi, Indonesia in 2018. Data collection is done by qualitative method. Qualitative data were collected by semi-structured interviews with informants who are considered to know about what will be studied in the field. Value chain mapping model used to describe the potato value chain and Analytical Hierarchy Process (AHP) model used to identify the various problems faced by the main actors of the potato value chain and how to solve the problem. The results showed that, (1) Potato value chain in South Sulawesi Province involves key actors and supporting actors. The main actors consist of potato farmers, collectors, wholesalers, retailers, and home industries. While supporting actors consist of agricultural extension agents, farmer groups, farm shops, farm laborers, seed growers, Labiota Foundation, inter-provincial traders, and consumers, and (2) The priority of potato value chain problems in the main actors is plant pests and diseases, lack of supply of potatoes, and damage to processed equipment and machinery. Priority in handling problems is the use of plant medicines appropriately, developing land for potato production, improving cultivation technology for farmers, and improving the quality of processed machinery.

1. Introduction

Analysis of each actor in the value chain is one way to increase the value added of a commodity. There are several actors in the value chain, namely farmers, traders and consumers [1]. The actors in the value chain are such that they maximize the formation of values along the chain. The first chain is in
the form of farmers who cultivate potato plants and the last chain is consumers who consume potato final products. In the middle of the chain there are individuals or groups who carry out transportation / move, process, sort, sell, buy, package, examine, supervise, make decisions and other activities in marketing. The condition of potato production and marketing can be used to improve information about the potato value chain. If the value chain operates smoothly without congestion or distortion, then farmers receive reasonable prices for their products and all consumers are able to buy potatoes [2]. These potato problems occur along the value chain. Value chain analysis is carried out to increase the role of cooperation between sectors starting from upstream to downstream.

From the results of the analysis, it can be seen the priority problems that occur and appropriate handling. In the value chain analysis book published by ACIAR (Australian Center for International Agricultural Research), it explains that the concept of value chain covers issues of organization and coordination, strategies, and strength relationships between various actors (main producers, processors, traders, service providers, etc.) in the value chain [3].

Several previous studies conducted value chain analysis by only identifying the activities of the actors, identifying margins, market structure and marketing channels [4]. Many of these studies have not carried out further analysis by identifying problems with various value chain actors and strategies to solve the problem [1]. Therefore, specific objective of the research is to (1) Identify a map of the potato value chain and (2) to analyze problems that cause harm to the main potato value chain actors and how to deal the problems.

2. Methods
The research was conducted in South Sulawesi, Indonesia. Data collection is done by qualitative method [5]. Qualitative data were collected by semi-structured interviews with informants who are considered to know about what will be studied in the field. Qualitative data collection is conducted through: (1) in-depth interview (2) focus group discussion and (3) document studies [6]. The qualitative data is used to map the potato value chain and to find out the activities of the main actors. Furthermore, to identify the various problems faced by the main potato value chain actors and how to solve existing problems, the analytical model used is the Analytical Hierarchy Process (AHP) model [7].

3. Results and discussion
3.1 Description of the development of potato commodities
Potato commodities in the Province of South Sulawesi in recent years have continued to increase. Potato commodities in the Province of South Sulawesi in recent years have continued to increase. Potato harvested area in 2016 was 1,661 ha and in 2018 it had reached 2,996 ha. The amount of potato production in 2016 was 13,492 tons and in 2018 it had reached 49,895 tons. This shows that with the increase in potato harvesting area in South Sulawesi Province, the production will also increase [7].

3.2 Characteristics of informants
Informants in this study included people who were the main actors in the potato value chain in South Sulawesi Province. The main actors include farmers who do potato farming, collecting traders who purchase potatoes from farmers and become suppliers to large traders and / or retailers, large traders who purchase large quantities of potatoes from collectors and resell them to retailers, retailers who sell potatoes to end consumers, and home industries that process potatoes into value-added products [8].

3.3 Map of the potato value chain in South Sulawesi
The potato value chain structure in South Sulawesi involves several actors. To be more clear about the map of the potato value chain the figure 1 :
Based on Figure 1, it describes that the potato value chain in South Sulawesi Province involves the main actors and supporting actors. The main actors consist of potato farmers, collectors, wholesalers, retailers, and home industries. The roles of each actor are described in Table 1.

**Table 1. The role of potato value chain actors in South Sulawesi.**

| No. | Main Actors      | Role                                                                 |
|-----|------------------|----------------------------------------------------------------------|
| 1.  | Potato Farmers   | Do potato production from cultivation to harvest and sell it to traders and or wholesalers. |
| 2.  | Collector        | Buy potatoes from farmers and sell them back to wholesalers and retailers. |
| 3.  | Wholesaler       | Buy potatoes from farmers and or collectors in large quantities and sell them back to traders between districts and or to inter-provincial traders. |
| 4.  | Retailers        | Buy potatoes from the collector in relatively small amounts for resale to consumers. |
| 5.  | Household Industry| Buy potatoes from retailers who then do processed potatoes into new products that have added value for sale to consumers. |

| No. | Supporting Actors | Role                                                                 |
|-----|-------------------|----------------------------------------------------------------------|
| 1.  | Extension Of Agriculture | Providing information on innovation and technology in the cultivation of potatoes and information about planning farming to farmers. |
| 2.  | Farmer Groups     | Become a forum for farmers to exchange information about cultivation and market conditions as well as |
distribution of subsidized saprodi assistance needed in the process of cultivating potatoes.

3. Inputs service  Providing tractor rental services for processing land to farmers.
4. Farmer Shop  Providing inputs needed by farmers in potato farming.
5. Farmer Workers  Providing services to farmers in the process of cultivating potatoes until harvest.
6. Seed grower  Providing seed needs for potato farmers.
7. Tissue culture seed producers  Producers who develop superior/quality potato seeds through tissue culture to sell to farmers by involving seed growers.
8. Inter-district traders  Traders who are outside Gowa Regency are still in the area of South Sulawesi Province that buys potatoes from collectors and big traders in Gowa Regancy and Bantaeng Regancy.
9. Inter-provincial traders  Traders on the island of Borneo who buy potatoes from large traders in the province of South Sulawesi.
10. Consumer  Individuals who buy potatoes from retailers as well as those who buy potato products from home industries.

3.4 Problem analysis and problem solving in potato value chains

3.4.1 Problem analysis. Potato farmers experience several problems in their farming process. These problems can occur in various forms of risk, such as reduced production, decreased quality of potatoes produced and high costs incurred. The three forms of risk are weighted based on their potential priorities in creating losses. The weight of each of these criteria is shown in figure 2.

Figure 2. Criteria weight at farmer level or main actor.

Figure 2 shows that the form of risk that has the lowest weight is the high cost incurred by farmers. This explains that the high costs incurred in cultivating potatoes are not the main problem for farmers as long as they can increase production and improve the quality of potatoes. There are problems faced by farmers in cultivating potatoes, it is necessary to solve problems that can overcome these three risks. The following is the identification of the problem and solving the potato value chain problem at the farm level and referred to as the main actor.

Identification of potato value chain problems at the farm level at the location of the study was conducted with in-depth discussion with informants. These results formulate that there are 7 problems that have the potential to create losses to farmers. The seven problems are plant pests and diseases, uncertain weather or unpredictable seasons, high rainfall, limited agricultural machinery and
equipment, expensive leasing of agricultural machinery and equipment, expensive agricultural production facilities, and fluctuating prices of potatoes.

Based on these three criteria, the priority of the problems of each of the three criteria is that the criteria for low production are mainly from pests and diseases, with low quality criteria mainly from pests and diseases and at high cost criteria mainly from pests and diseases. The following is the size of the problem from each criterion at the farm level shown in figure 2.

**Figure 2.** Size of the problem from each criterion at the farm level

**Figure 3.** Priority sequence issues from third criteria for potato value chain problems at farmer level

A = Attack of pests and diseases
B = erratic weather
C = High rainfall
D = Limited alsintan
E = expensive machine rental
F = inputs are expensive
G = potato prices fluctuate
Based on the results of the problem analysis on the potato value chain at the farm level, it is associated with all existing criteria, so the priority of the problem is pest and plant disease attacks. Complete priority sequence of 7 problems in the potato value chain at the farm level is shown in figure 4.

In figure 4, the priority of the problem is pest and plant disease attacks. This is because there are pests and plant diseases that attack the potato tubers, causing tuber rot which causes the plants to wither, so the quality and quantity of potatoes decreases [9,10].

3.4.2. Identification of Problem Solving at the Farmer Level. Based on the three risk handling criteria, the priority of problem solving from each criterion is that the high production criteria prioritize the use of agricultural medicines appropriately, and at low costs prioritize the assistance of alsintan and production inputs by the government to farmers. The following is the size of the problem solving from each criterion at the farm level, shown in figure 5.
Based on the analysis of problem solving in the potato value chain at the farm level, it is associated with all existing criteria, so the problem solving priority is the proper use of agricultural medicines. Complete priority sequence of 7 problem solving in the potato value chain at the farm level is shown in figure 6.

**Figure 5.** Priority order problem solving from the three criteria potato value chains farmer level

**Figure 6.** Priority order solving potential value chain problems at farmer levels.

4. Conclusion
The potato value chain flow in South Sulawesi flows mostly to inter-provincial traders, namely 76% and 77.1% by passing through the main value chains of farmers, wholesalers and inter-provincial traders flowing to Kalimantan Island, Kendari City and Baubau City. The priority of the potato value chain problem at the farm level is the attack of pests and plant
diseases with the priority of handling the potato value chain problem at the farm level is the use of plant medicines appropriately.

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