

3. Main Priorities in Value Added Improvement-Based On Commodity Processing System. Dipublikasin pada Jurnal JEJAK: Jurnal Ekonomi dan Kebijakan 2017, 20, 2, ISSN: 2460-5123. Published
Link <https://journal.unnes.ac.id/nju/index.php/jejak/article/view/11300>



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#10168 Review

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Submission



Authors Dyah Maya Nihayah 
Title Main Priorities in Value Added Improvement-Based On Commodity Processing System
Section Articles
Editor Ozlem Atay 

Peer Review

Round 1

Review Version 10168-23203-1-RV,DOCK 2017-06-22
Initiated 2017-07-24
Last modified 2017-07-24
Uploaded file None

Editor Decision

Decision Accept Submission 2017-07-24
Notify Editor  Editor/Author Email Record  No Comments
Editor Version 10168-23996-1-ED,DOCK 2017-07-24
Author Version None
Upload Author Version No file chosen



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Main Priorities in Value Added Improvement-Based On Commodity Processing System

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ABSTRACT

The huge number of rambutan plants in Gunungpati has resulted in the decline of rambutan sales price during harvest season, i.e. Rp 1,500.00 per pack, any unsold rambutan tends to immediately wilt, break and deteriorate. This research is aimed to the sequence of commodity processing priority in order to increase the product's value-added. This study is an action research, using descriptive statistic and Analytical Hierarchy Process (AHP). The results indicate that a counseling since production until post-harvest becomes the highest priority, followed by produce sorting, and availability of produce processing technology. It is necessary to have practical field-based initiatives of businesses farmers who have managed to do the innovations, competitive advantage, and then to rise the competitiveness. To make this value-added-based horticulture commodity processing system work, Government role is required to guiding and evaluating every policy priorities.

Keywords: priority, processing, commodity, value added, AHP

ABSTRAK

Banyaknya tanaman rambutan di Gunungpati pada saat musim panen mengakibatkan harga jual rambutan sangat rendah, hanya mencapai paling tinggi Rp 1.500,00 per ikat. Buah rambutan yang tidak habis terjual akan cepat layu, rusak dan busuk. Tujuan penelitian untuk menentukan urutan prioritas pengolahan komoditas agar nilai tambah produk meningkat. Penelitian ini merupakan penelitian riset aksi, dengan alat analisis deskriptif statistik dan metode *Analtical Hierarchy Process* (AHP). Hasil penelitian menunjukkan bahwa pada sistem pengolahan komoditas hortikultur tahapan penyuluhan sejak dari aspek produksi sampai pasca panen menjadi prioritas tertinggi, kemudian diikuti sortir hasil panen, ketersediaan teknologi pengolahan hasil, inovasi & diversifikasi produk olahan. Oleh karena itu, supaya sistem pengolahan berbasis nilai tambah pada komoditas hortikultura ini dapat berjalan dengan baik, peran pemerintah sangat dibutuhkan untuk membimbing, melaksanakan dan mengawasi setiap prioritas kebijakannya.

Kata Kunci : prioritas, pengolahan, komoditas, *value added*, AHP

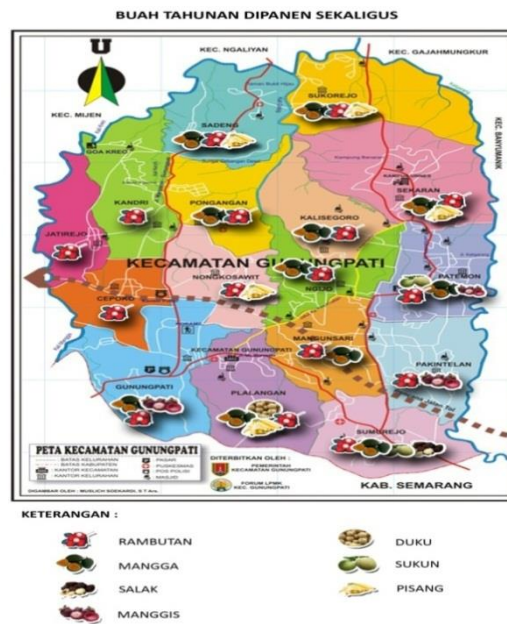
INTRODUCTION

Gunungpati District is a green belt for Semarang Municipality. In order to prevent any possible land function transfer, the Government of Semarang Municipality has decided to make Gunungpati District an agro-tourism area. This decision to make Gunungpati District an agro-tourism area has been in accordance with 2000-2010 Spatial Planning/RTRW of Semarang Municipality. One of the programs to deal with critical lands is *Program Konservasi Lahan Semarang Atas dan Pengentasan Kemiskinan* (PKLSAPK/Upper Semarang Land Conservation and Poverty Eradication Program) which has been implemented since 2007. In this program, cultivations of various horticulture plants are performed in Gunungpati District. Many species of plants are cultivated to save critical lands in the area.

Research on cultivations of horticulture plants in Gunungpati begins with the mapping of horticulture economic potential, which was conducted by Margunani, *et al* (2012). Their research found that land structure and contour significantly influence the distribution of horticulture plant commodities in Gunungpati. The horticulture plant species commonly cultivated are fruit crops such as durian, rambutan, jackfruit, and water apple. Meanwhile, yard long bean and red bird eye's chili are two commonly-cultivated horticulture commodities for vegetables.

Murwatiningsih (2013) conducts further research and finds that the development of post-harvest commodity of horticulture plants is still minimum and needs some reinforcement to improve their added value. These findings support Nihayah (2012) who says that any policy made should be intensive in nature such as market penetration, market development, and added value development of the products generated from fruit crops cultivation.

In Gunungpati District, the commonly-cultivated plant commodities are jackfruit and rambutan. Rambutan is the most commonly-cultivated plant species. This plant is cultivated by 17 out of 26 farmer groups (65.4%) existing in Gunungpati District (Margunani, *et al*, 2012). When this economic potential can be managed well, its society's welfare level could increase (Nihayah, 2012). Until recently there has been no efficient post-harvest fruit and vegetable processing system. In general, fruits are sold as is. For example, during harvest season, rambutan sales price is so low, only Rp. 1,500.00-2,000.00 per pack. Due to the very low sales price of the commodity, many of the plant owners complain about how their sales could not cover the costs for picking and transporting them. Many of the produce are left to fall from the trees. Such condition shows that the low quality horticulture products are tightly related to the weak production system, harvest system, post-harvest handling, distribution, and marketing system. (Figure 1)



Source: Margunani *et al* (2012)
 Figure 1. Map of Rambutan Plant Distribution in Gunungpati Area

During harvest time, rambutan production is overwhelming, its price is so low and any unsold rambutan will immediately wilt, break and deteriorate. The application post-harvest technology becomes the solution expected to be able to maintain, improve and increase the sales price of horticulture commodity. According to Lambert *et al* (2006), there are two ways to increase value added: (1) increasing the efficiency of production, thereby widening the margin between gross output value and the cost of intermediate inputs; (2) changing the form, function, quantity, or other product or process characteristics that increases the margin between gross output value and intermediate input cost.

An economic effort could be made in order for the fruits to be edible and to have greater value added which, in turn, would improve the welfare of farmer groups in Gunungpati District area. The processing of horticulture commodity into a number of food products is not a priority given that its existence has been abundant each year. Therefore, there is a need for research to create a holistic system ranging from harvest method, produce processing and product marketing system in order to increase the product's value added. The processing of agro produce could improve farmers' welfare (Watanebe, *et al*, 2009).

This study aims at determining the sequence of priority in the process of commodity processing and to develop a holistic system to identify risk factors, to measure the risk importance level, and to find an alternative strategy for value added improvement. The current research is based on the mapping made by Margunani, *et al*. (2012) which shows the potential of fruit and vegetable horticulture commodity and Murwatiningsih (2013) which forms an agro-business center for horticulture commodity in Gunungpati.

RESEARCH METHOD

The types of data used by this research are primary and secondary data. The primary data are obtained from personal interviews and Focus Group Discussion (FGD) with its key persons amounting to 25, namely farmers or vegetable and fruit horticulture agro-business agents. These key persons are selected using stratified sampling. Those farmers are divided into strata (groups) by their location (sub-districts). Such selection by location is used considering that it is this factor which distinguishes them because every location has different structures and characteristics. The secondary data or desk study are obtained from records of Central Java BPS, Semarang Municipality BPS, Office of Food Crops and Horticulture Agriculture of Semarang Municipality and Central Java Province as well as several data literatures and publications supporting the research.

In compiling this study, descriptive quantitative and descriptive qualitative analyses are used. Analytical Hierarchy Process (AHP) is used as an analysis tool to determine the sequence of priority in the commodity processing system where the criteria are obtained by identifying the risk factors, measuring the risk importance level and needs assessment.

AHP allows the user to determine the relative weights of the criteria of a compound (or an alternative compound of a criterion) intuitively, by doing pair wise comparisons, then change the pair wise comparisons into a set of numbers that represents the relative priority of each criterion and alternatives in a consistent way. The assessment was performed by the decision makers who are experts in the field of issues that are being analyzed and who have an interest to it. Assessment criteria and alternatives do with making judgments on the relative importance between the two elements at a certain level in relation to the level above it (Setiawan, et al, 2014). Through pair wise comparison of elements of decision, this is done by using a rating scale (scale of 1 to 9 and the reverse).
Table 1

Table 1. The 1-9 comparison scale

Intensity of relative importance	Definition	Explanation
1	Equal importance	Two activities contribute equally to the objective
3	Moderate importance of one relative to the other	Experience and judgment slightly favor one activity over another
5	Essential or strong importance	Experience and judgment strongly favor one activity over another.
7	Demonstrated importance	One activity is strongly favored, and its dominance is demonstrated in practice
9	Extreme importance	The evidence favoring one activity over another is of the highest possible order of affirmation
2, 4, 6, 8	Mean values between two close judgments	When compromise is needed
Reciprocity of the above non-		If one activity has one of the above numbers (for example, 3), compared to the other activity, then the second activity has the reciprocal value (i.e.

zero numbers	1/3), when compared with the other.
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Source : Saaty & Kearns in Mimovic and Ana Krstic (2016)

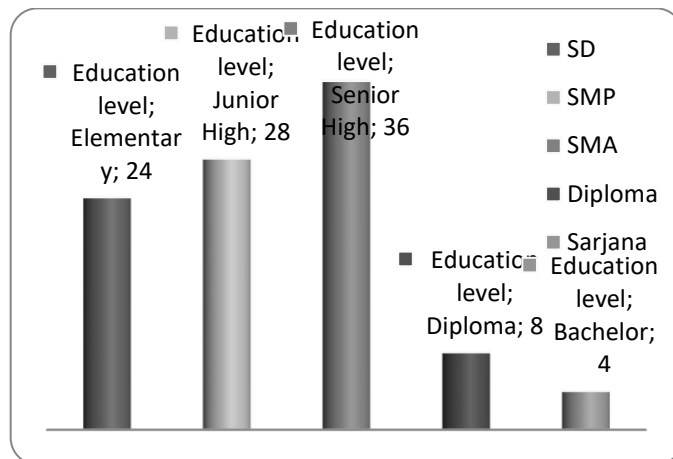
Measurement of Consistency is an important characteristic of AHP. Setiawan et.al (2014) state that assessment criteria between elements with one another is not entirely consistent. AHP allows the assessment inconsistencies but should not exceed 10 %. This measurement is done by aggregating the entire eigenvector obtained from various levels of hierarchy, such that the obtained composite weighted vector which generates a sequence of decision making. Measurement consistency of a matrix based on an eigenvector maximum (λ_{max}). The closer λ_{max} obtained with n, the more consistent results.

RESULTS AND DISCUSSIONS

Respondent Characteristics

Gunungpati District consists of 16 sub-districts and only 13 of them have farmer groups. These sub-districts with no farmer groups are Sadeng, Kandri and Pongangan Sub-districts. In Sadeng Sub-district case, this is because the majority of population there are factory labors because it is one of industrial zones in Semarang Municipality. Meanwhile, most of Kandri Sub-district population are ranchers and, thus, rather than a farmer group, this area has a rancher group instead.

Judging from the respondents' educational level, it could be seen that most of them do not have higher education. It is important to discover their educational background since it determines the possibility of giving them knowledge and technology upgrade in regard to a more effective and efficient cultivation.



Source: processed Primary Data

Figure 2. Respondents based on educational background (%)

From figure 2, it could be seen that more than 50% of horticulture agribusinessmen have educational background below senior high-school. This indicates that the management of agribusiness has more emphasis on the technical

ability gained from generation to generation. The technical ability grows stronger as they work longer on managing agribusiness and plantation business.

Value-Added-Based Horticulture Commodity Processing System

Based on the identification of risks and Need Assessment from focus group discussion (FGD) of stakeholders, some criteria and sub-criteria which determine the horticulture commodity processing system in Gunungpati District could then be made. There are 5 criteria in this system namely Input and Cultivation, Harvest, Produce Processing, Institution and Marketing. From each of those criteria, alternative sub-criteria which constitute priorities could be made (Figure 3).

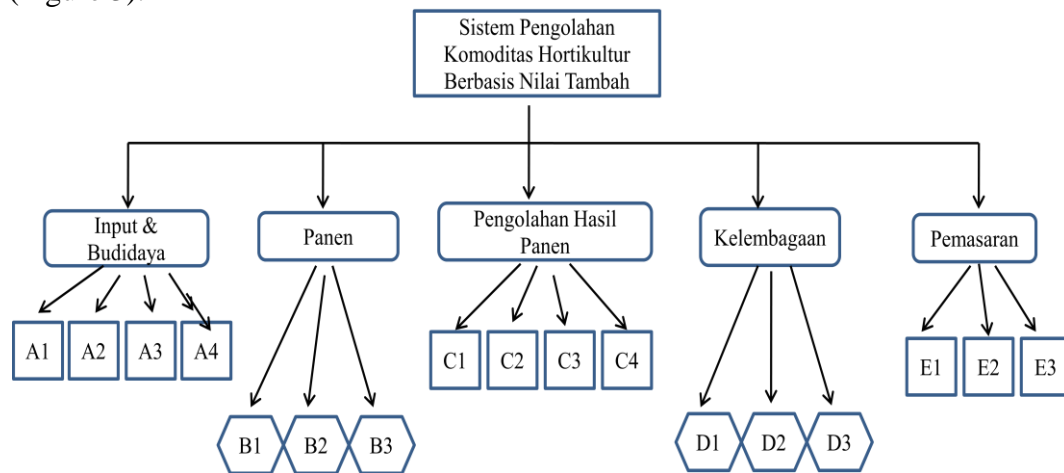


Figure3. Alternative Criteria in Value-Added-Based Horticulture Commodity Processing System

In the criteria of Input supply (of horticulture commodity) and Cultivation there are some sub-criteria being reviewed they are; 1) Selection of superior and quality seeds (A1); 2) Proper use of fertilizers in terms of its dose and usage (A2); 3) Handling of cultivation risks (A3); and 4) Counseling and guidance from the government (A4). Then, from Input and Cultivation processes, the next stage would be value added improvement which starts from the Harvest criterion. There are several alternative sub-criteria, they are; 1) Determination of fruit criteria and quality (B1); 2) Produce sorting (B2); 3) Long-term availability of fruits (B3).

The next criterion is Produce Processing. In this criterion it can be seen that the existence of support of technology and its mastery become the sub-criteria to which the concern is addressed in determining priority in the horticulture commodity processing system later. These sub-criteria include; 1) Availability of produce processing technology (C1); 2) Innovation and diversification of processed products (C2); 3) Skills and abilities of HR (C3); 4) Post-harvest counseling and guidance (C4).

The available support of technology would influence the processed product's market entry. Therefore, institutional readiness is needed. From the Institution criterion, the sub-criteria observed are as follows; 1) Capacity of farmer groups (D1); 2) Partnership with other institutions: cooperatives and other groups (D2); 3) Managerial ability of group chief (D3).

After institutional readiness, the next criteria would be market access and relatedness (Branding, Packaging & Labeling). These criteria are highly determinants since they would be able to cause market increase and retention (market identification & business partnership). The sub-criteria to be observed are 1) Attractive packaging and labeling (E1); 2) Market information: price, competitor etc. (E2). 3) Marketing network (E3).

Analytical Hierarchy Process (AHP)

After grasping the overview of descriptive analysis, it is then followed with the analysis to determine the sequence of priority in the horticulture commodity processing using Analytical Hierarchy Process (AHP) model. As have been explained above, AHP method is used to select the criteria and their alternatives to achieve the goal.

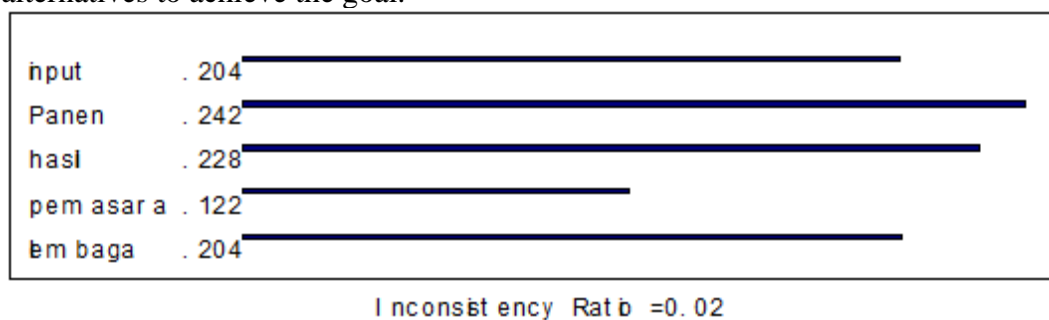


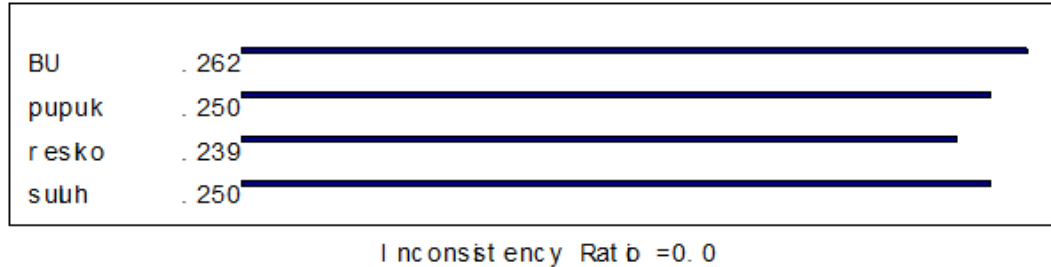
Figure 4. Criteria in Horticulture Commodity Processing System

In Figure 4, it is shown that the Harvest criterion (0.242) is the most important one in this value-added-based horticulture commodity processing system. It is then followed consecutively by such criteria as Produce Processing (0.228), Input and Cultivation (0.204), Institutionalization (0.204) and Marketing (0.122). This indicates that in horticulture commodity processing system, harvest process is highly determinants to the product quality later. The first stage which needs to be considered is the determination of criteria and quality of fruits and vegetables to be harvested. The next criterion being studied is the sorting of produce. Upon sorting and cleaning, the next one is grading. This is intended to obtain good quality and identical produce in the same grade/class according to the quality standards which have been determined or requested by customers.

The harvest criterion also includes availability of fruits in market. This availability is influenced by fruit production. The problem found in the way of fruit development is the availability of lands which, in terms of their agro-climate characteristics, suit the requirement for certain fruit production development. In reality, these lands are frequently used for the production of food commodity, plantation, or other functions. A different condition is found in Gunungpati District. 30% of its land structure is Dark Brown Mediterranean and it suits very well with and has the potential for development to cultivate perennial crops, agricultural crops and *palawija* (secondary) crops. However, in reality many lands are converted into residential area. This is what happens in Gunungpati. Despite its huge potential for fruit and vegetable production, many obstacles are in the way of its development. The tiny level of local fruit procurement makes it hard to ensure its quantity, quality, standardization, and continuity, while in facts, these factors significantly determines its competitiveness.

Input and Cultivation Criteria

Based on the Input and Cultivation criteria, the selection of superior and quality seeds in horticulture cultivation in Gunungpati District becomes the main sub-criterion.



Source: Primary data (processed)

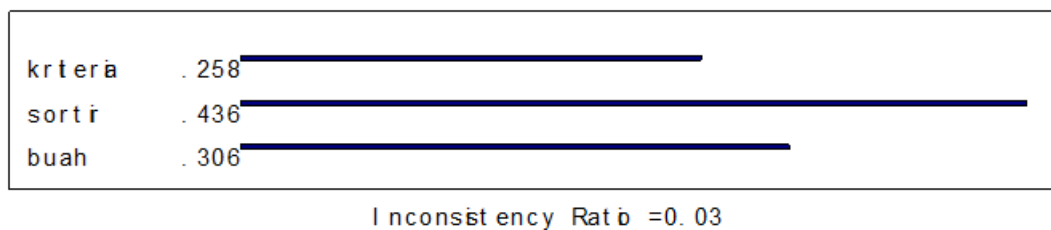
Description:

- BU : Selection of superior and quality seeds.
- Pupuk : Proper use of fertilizer in terms of its dose and usage.
- Resko : Management of cultivation risks.
- Suluh : Counseling and guidance from the government.

Figure 5. Superior Priority in Horticulture Commodity Processing System Based on Input & Cultivation Criteria

In figure 5 it can be seen that the selection of superior, high-quality seeds has an important role to play in the effort of improving production since when these seeds are not used, the application of any other production means will be less beneficial and even may cause harms to farmers in Gunungpati District. The sub-criteria ranked second in its priority are the Proper use of fertilizer in terms of its dose and usage (0.25) and Counseling and guidance from the government (0.250). Guidance and assistance become important elements in mobilizing farmers to improve their production. By concentrating on the valuable input and resources they have, it is expected that they can strengthen and retain their unique product and bargaining position at the market (Persson, 2015).

Harvest Criterion



Source: Primary data (processed)

Description:

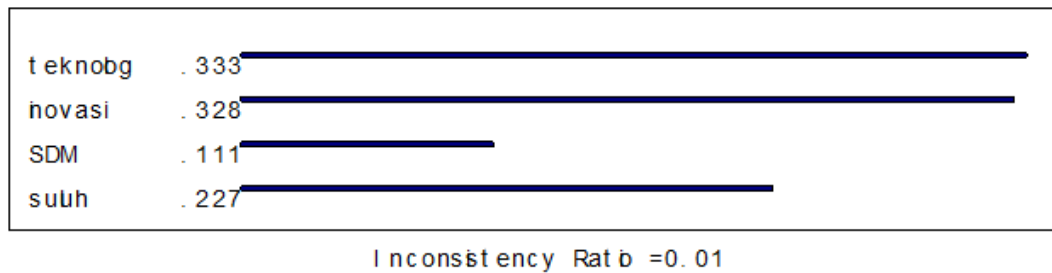
- Kriteria : Determination of fruit criteria and quality
- Sortir : Produce sorting.
- Buah : Long-term availability of fruits.

Figure 6. Superior Priority in Horticulture Commodity Processing System

Based on Harvest Criterion

As for the harvest criterion, the most dominant sub-criterion is produce sorting (Figure 6). The sorting phase becomes critical since this is intended to obtain good quality and identical produce in the same grade/class according to the quality standards which have been determined or requested by customers. The second most important sub-criterion is long-term availability of fruits (0.306) and lastly the determination of fruit criteria and quality (0.258)

The Produce Processing Criterion



Source: Primary data (processed)

Description:

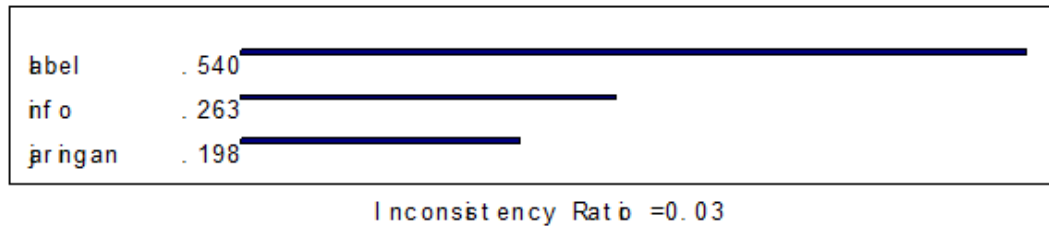
- Teknolog : Availability of produce processing technology.
- Inovasi : Innovation and diversification of processed products.
- SDM : Skills and abilities of its HR.
- Suluh : Post-harvest counseling and guidance.

Figure 7. Superior Priority in Horticulture Commodity Processing System Based on Produce Processing Criterion

From figure 7, it can be seen that the produce processing and technology availability criteria are the highest sub-criteria at 0.333, followed by innovation and diversification of processed products (0.328). This processing technology becomes the key to improve value-added in production aspect. Members of farmer groups could perform an activity or adopt a production practice which changes the identity or quality of raw product characteristics into a product characteristic desired by customers thanks to its higher value at the market place (Lu, Ruoxi and Rebekka Dudensing, 2015).

Marketing Criterion

Attractive packaging and labeling is the most-prioritized subcriteria in the market access and relatedness aspect (Branding, Packaging & Labeling) at 0.543 (Figure 8).



Source: Primary data (processed)

Description:

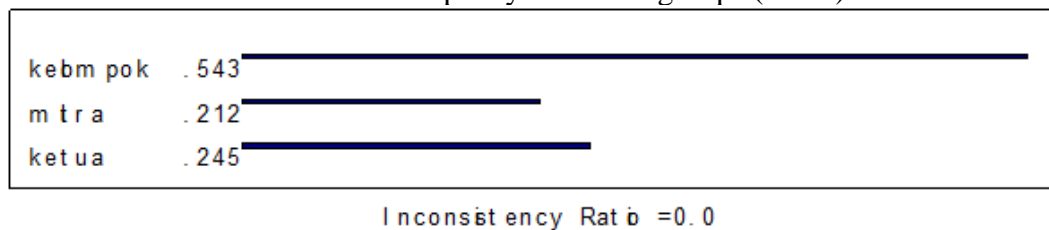
- Label : Attractive packaging and labeling
- Info : Market information: price, competitor, etc.
- Jaringan : Marketing network.

Figure 8. Superior Priority in Horticulture Commodity Processing System Based on the Criterion of Marketing

The second highest priority is Market information: price, competitor etc (0.263). And the least prioritized sub-criterion is marketing network at 0.198. In Gunungpati District, packaging remains an aspect to which less attention is paid by business agents/farmers. This is inappropriate since, in addition to protect the commodity against any mechanical damage, packaging also serves the function of attracting customers and giving value added to the product and extending the product's storability. Therefore, packaging should be done carefully to avoid any extreme temperature and humidity (too high/too low), shock, vibration, friction and high pressure to the package of such produce.

Institution Criterion

In figure 9, it is shown that the highest sub-criterion in the processing system based on Institution Criterion is capacity of farmer groups (0.543).



Source: Primary data (processed)

Description:

- Kelompok : Capacity of farmer groups.
- Mitra : Partnership with other institutions: cooperatives and other groups.
- Ketua : Managerial ability of group chief.

Figure 9. Superior Priority in Horticulture Commodity Processing System Based on the Criterion of Institution

The operational steps practicable in the effort of strengthening farmer groups include; (Hermanto, 2011) (1) Motivating and guiding farmers to enable them to cooperate economically in groups, (2) Growing and developing farmer groups by increasing their access to capital, improving their bargaining position, facilitating

and nurturing their group organization, and improving their agribusiness efficiency and effectiveness, and (3) Increasing farmers' HR capacity through such activities as assistance and training designed specifically for the management and members of farmer groups.

The result of Analytic Hierarchy Process as a whole can be seen in figure 9. In horticulture commodity processing system in Gunungpati District, there are 5 highest priorities and they could be alternative strategies to improve value added.

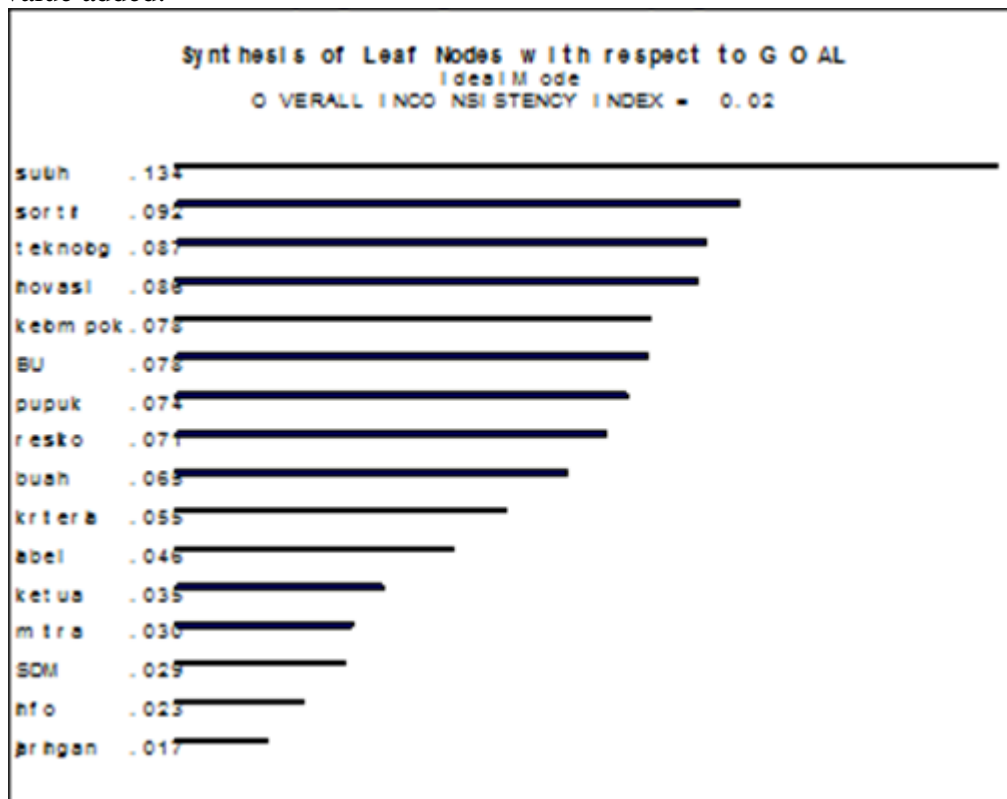


Figure 9
Sequence of alternative development priorities in added-value-based horticulture commodity processing system in Gunungpati District

In horticulture commodity processing system in Gunungpati District, there are 5 highest priorities and they could be alternative strategies to improve *value added*. These five priorities are counseling on production aspects, i.e. the counseling and guidance from the government and post-harvest counseling and guidance, at 0.134, Produce sorting (0.92), Availability of produce processing technology (0.88), innovation & diversification of processed products (0.86). The fifth priority has 2 sub-criteria which could be alternative strategies, namely selection of superior, high-quality seeds and capacity of farmer groups at an identical score of 0.78.

The criterion of agriculture counseling in horticulture processing system in Gunungpati District becomes the most important priority in this value-added-based commodity processing system. This is because it is no longer the time for a counseling to just teach how to farm or to transfer technology, rather it should also teach how to empower the farmers' human resources to enable them

to be the real human beings as a subject of agricultural development. Most horticulture farmers in Gunungpati District do not know post-harvest processing. All they do is selling and no new innovation has been made to make their produce more varied with high sales price. Only a few vegetable and fruit farmers could utilize well-processed produce. So far, no post-harvest technologies could compete with the pre-harvest ones, at farmers' level in particular, resulting in many produces being depreciated and undergoing undesired quality degradation.

Past experience has proven that many horticulture products lose their values or "*muspra*" (wasted) as a result of less attention being paid to post-harvest processes. For example, so huge number of rambutan in Gunungpati are wasted or deteriorate because farmers or local society do not know how to handle this overwhelming amount of rambutan production. Post-harvest counseling and guidance on the way to handle horticulture produce is critical since this product in general should be consumed freshly and it is perishable. Therefore, counseling should aim at teaching how to preserve its freshness and to prevent any undesired change from occurring when it is stored to allow its development into products preferable to customers.

Meanwhile, post-harvest technology becomes the next priority since it has not been implemented well in handling horticulture product, even though it is technically easy for horticulture agribusiness agents to apply it. Post-harvest technology is still partially applied, i.e. only those with small or almost no investment costs or economically profitable, are preferred. In order to stimulate farmers' performance and counselor in the field, there is a need for agriculture policy innovation. It means government's role in agriculture innovation system is to provide fund for innovating activities and incentive for private investment and adoption of innovation and technology (OECD. 2015)

Capacity of farmer groups becomes the fifth priority and some efforts need to be done such as institutional development, empowerment and strengthening. Therefore, members of farmer groups really need to be active since in the future they will use the institution to improve their agro-business productivity in order to lift their welfare. It is expected that farmer groups will be independent, resilient, thoughtful, honest, creative, productive, emancipatory, reliable, proactive, dynamic, open-minded and responsible in dealing with every problem and facing any challenge for their own advancement.

It is confirmed by Kelly (2012) who suggests that traditional farmer organizations are one of a number of ways for organizing the supply of farmer's products through a value chain to the market and for strengthening farmers' bargaining position in the face of competition with modern farmers. When these farmer organizations reach a high level of togetherness, they will be able to deal with main obstacles related to high transaction costs, to easily penetrate marketplace and to access business and financial development services and most importantly to reactivate negotiation with their marketing chain.

CONCLUSION

The processing of horticulture commodity into various food products becomes more critical in Gunungpati District given its abundant number in every year. A holistic system to identify risk factors, to measure the risk importance

starting from harvest method to produce processing to product marketing system needs to be implemented to get alternative strategies for the sake of improving value added. The research results indicate that a counseling since production to post-harvest becomes the highest priority, followed by produce sorting, availability of produce processing technology, and innovation & diversification of processed products.

To make this value-added-based horticulture commodity processing system work, the role that the government plays in guiding and evaluating every policy priority they implement is required. In addition, there is a need for practical field-based initiatives from every productive agribusiness-man who has succeeded in making innovations and lifting their competitive strengths in order for them to have competitiveness.

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Main Priorities in Value Added Improvement-Based On Commodity Processing System

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ABSTRACT

The huge number of rambutan plants in Gunungpati has resulted in the decline of rambutan sales price during harvest season, i.e. Rp 1,500.00 per pack, any unsold rambutan tends to immediately wilt, break and deteriorate. This research is aimed to the sequence of commodity processing priority in order to increase the product's value-added. This study is an action research, using descriptive statistic and Analytical Hierarchy Process (AHP). The results indicate that a counseling since production until post-harvest becomes the highest priority, followed by produce sorting, and availability of produce processing technology. It is necessary to have practical field-based initiatives of businesses farmers who have managed to do the innovations, competitive advantage, and then to rise the competitiveness. To make this value-added-based horticulture commodity processing system work, Government role is required to guiding and evaluating every policy priorities.

Keywords: priority, processing, commodity, value added, AHP

ABSTRAK

Banyaknya tanaman rambutan di Gunungpati pada saat musim panen mengakibatkan harga jual rambutan sangat rendah, hanya mencapai paling tinggi Rp 1.500,00 per ikat. Buah rambutan yang tidak habis terjual akan cepat layu, rusak dan busuk. Tujuan penelitian untuk menentukan urutan prioritas pengolahan komoditas agar nilai tambah produk meningkat. Penelitian ini merupakan penelitian riset aksi, dengan alat analisis deskriptif statistik dan metode *Analtical Hierarchy Process* (AHP). Hasil penelitian menunjukkan bahwa pada sistem pengolahan komoditas hortikultur tahapan penyuluhan sejak dari aspek produksi sampai pasca panen menjadi prioritas tertinggi, kemudian diikuti sortir hasil panen, ketersediaan teknologi pengolahan hasil, inovasi & diversifikasi produk olahan. Oleh karena itu, supaya sistem pengolahan berbasis nilai tambah pada komoditas hortikultura ini dapat berjalan dengan baik, peran pemerintah sangat dibutuhkan untuk membimbing, melaksanakan dan mengawasi setiap prioritas kebijakannya.

Kata Kunci : prioritas, pengolahan, komoditas, *value added*, AHP

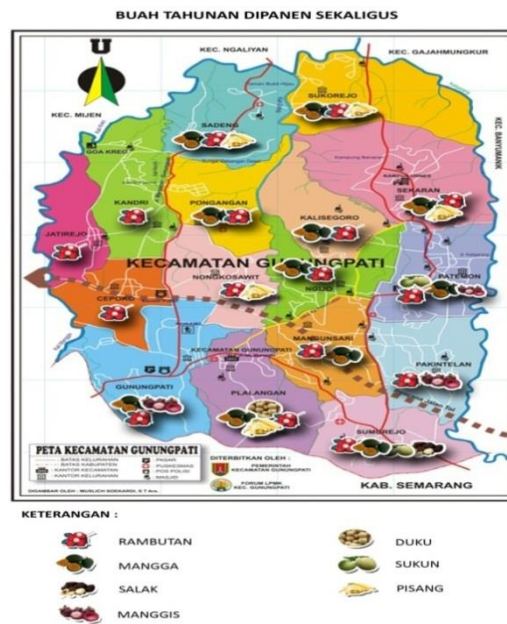
INTRODUCTION

Gunungpati District is a green belt for Semarang Municipality. In order to prevent any possible land function transfer, the Government of Semarang Municipality has decided to make Gunungpati District an agro-tourism area. This decision to make Gunungpati District an agro-tourism area has been in accordance with 2000-2010 Spatial Planning/RTRW of Semarang Municipality. One of the programs to deal with critical lands is *Program Konservasi Lahan Semarang Atas dan Pengentasan Kemiskinan* (PKLSAPK/Upper Semarang Land Conservation and Poverty Eradication Program) which has been implemented since 2007. In this program, cultivations of various horticulture plants are performed in Gunungpati District. Many species of plants are cultivated to save critical lands in the area.

Research on cultivations of horticulture plants in Gunungpati begins with the mapping of horticulture economic potential, which was conducted by Margunani, *et al* (2012). Their research found that land structure and contour significantly influence the distribution of horticulture plant commodities in Gunungpati. The horticulture plant species commonly cultivated are fruit crops such as durian, rambutan, jackfruit, and water apple. Meanwhile, yard long bean and red bird eye's chili are two commonly-cultivated horticulture commodities for vegetables.

Murwatiningsih (2013) conducts further research and finds that the development of post-harvest commodity of horticulture plants is still minimum and needs some reinforcement to improve their added value. These findings support Nihayah (2012) who says that any policy made should be intensive in nature such as market penetration, market development, and added value development of the products generated from fruit crops cultivation.

In Gunungpati District, the commonly-cultivated plant commodities are jackfruit and rambutan. Rambutan is the most commonly-cultivated plant species. This plant is cultivated by 17 out of 26 farmer groups (65.4%) existing in Gunungpati District (Margunani, *et al*, 2012). When this economic potential can be managed well, its society's welfare level could increase (Nihayah, 2012). Until recently there has been no efficient post-harvest fruit and vegetable processing system. In general, fruits are sold as is. For example, during harvest season, rambutan sales price is so low, only Rp. 1,500.00-2,000.00 per pack. Due to the very low sales price of the commodity, many of the plant owners complain about how their sales could not cover the costs for picking and transporting them. Many of the produce are left to fall from the trees. Such condition shows that the low quality horticulture products are tightly related to the weak production system, harvest system, post-harvest handling, distribution, and marketing system. (Figure 1)



Source: Margunani *et al* (2012)
 Figure 1. Map of Rambutan Plant Distribution in Gunungpati Area

During harvest time, rambutan production is overwhelming, its price is so low and any unsold rambutan will immediately wilt, break and deteriorate. The application post-harvest technology becomes the solution expected to be able to maintain, improve and increase the sales price of horticulture commodity. According to Lambert *et al* (2006), there are two ways to increase value added: (1) increasing the efficiency of production, thereby widening the margin between gross output value and the cost of intermediate inputs; (2) changing the form, function, quantity, or other product or process characteristics that increases the margin between gross output value and intermediate input cost.

An economic effort could be made in order for the fruits to be edible and to have greater value added which, in turn, would improve the welfare of farmer groups in Gunungpati District area. The processing of horticulture commodity into a number of food products is not a priority given that its existence has been abundant each year. Therefore, there is a need for research to create a holistic system ranging from harvest method, produce processing and product marketing system in order to increase the product's value added. The processing of agro produce could improve farmers' welfare (Watanebe, *et al*, 2009).

This study aims at determining the sequence of priority in the process of commodity processing and to develop a holistic system to identify risk factors, to measure the risk importance level, and to find an alternative strategy for value added improvement. The current research is based on the mapping made by Margunani, *et al*. (2012) which shows the potential of fruit and vegetable horticulture commodity and Murwatiningsih (2013) which forms an agro-business center for horticulture commodity in Gunungpati.

RESEARCH METHOD

The types of data used by this research are primary and secondary data. The primary data are obtained from personal interviews and Focus Group Discussion (FGD) with its key persons amounting to 25, namely farmers or vegetable and fruit horticulture agro-business agents. These key persons are selected using stratified sampling. Those farmers are divided into strata (groups) by their location (sub-districts). Such selection by location is used considering that it is this factor which distinguishes them because every location has different structures and characteristics. The secondary data or desk study are obtained from records of Central Java BPS, Semarang Municipality BPS, Office of Food Crops and Horticulture Agriculture of Semarang Municipality and Central Java Province as well as several data literatures and publications supporting the research.

In compiling this study, descriptive quantitative and descriptive qualitative analyses are used. Analytical Hierarchy Process (AHP) is used as an analysis tool to determine the sequence of priority in the commodity processing system where the criteria are obtained by identifying the risk factors, measuring the risk importance level and needs assessment.

AHP allows the user to determine the relative weights of the criteria of a compound (or an alternative compound of a criteria) intuitively, by doing pair wise comparisons, then change the pair wise comparisons into a set of numbers that represents the relative priority of each criteria and alternatives in a consistent way. The assessment was performed by the decision makers who are experts in the field of issues that are being analyzed and who have an interest to it. Assessment criteria and alternatives do with making judgments on the relative importance between the two elements at a certain level in relation to the level above it (Setiawan, et al, 2014). Through pair wise comparison of elements of decision, this is done by using a rating scale (scale of 1 to 9 and the reverse).
Table 1

Table 1. The 1-9 comparison scale

Intensity of relative importance	Definition	Explanation
1	Equal importance	Two activities contribute equally to the objective
3	Moderate importance of one relative to the other	Experience and judgment slightly favor one activity over another
5	Essential or strong importance	Experience and judgment strongly favor one activity over another.
7	Demonstrated importance	One activity is strongly favored, and its dominance is demonstrated in practice
9	Extreme importance	The evidence favoring one activity over another is of the highest possible order of affirmation
2, 4, 6, 8	Mean values between two close judgments	When compromise is needed
Reciprocity of the above non-		If one activity has one of the above numbers (for example, 3), compared to the other activity, then the second activity has the reciprocal value (i.e.

zero numbers	1/3), when compared with the other.
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Source : Saaty & Kearns in Mimovic and Ana Krstic (2016)

Measurement of Consistency is an important characteristic of AHP. Setiawan et.al (2014) state that assessment criteria between elements with one another is not entirely consistent. AHP allows the assessment inconsistencies but should not exceed 10 %. This measurement is done by aggregating the entire eigenvector obtained from various levels of hierarchy, such that the obtained composite weighted vector which generates a sequence of decision making. Measurement consistency of a matrix based on an eigenvector maximum (λ_{max}). The closer λ_{max} obtained with n, the more consistent results.

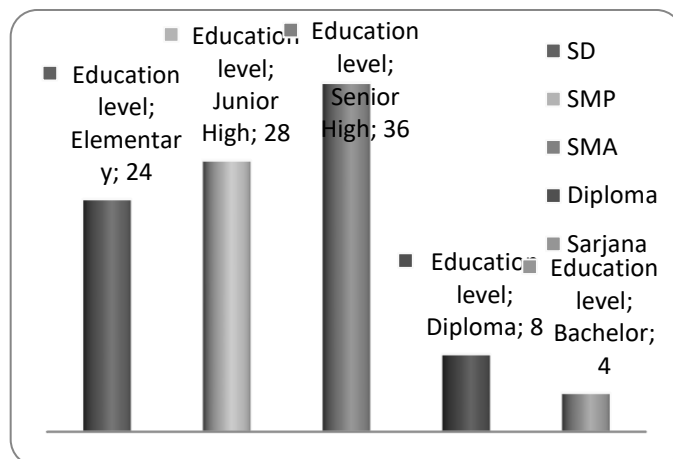
RESULTS AND DISCUSSIONS

RESULT

Respondent Characteristics

Gunungpati District consists of 16 sub-districts and only 13 of them have farmer groups. These sub-districts with no farmer groups are Sadeng, Kandri and Pongangan Sub-districts. In Sadeng Sub-district case, this is because the majority of population there are factory labors because it is one of industrial zones in Semarang Municipality. Meanwhile, most of Kandri Sub-district population are ranchers and, thus, rather than a farmer group, this area has a rancher group instead.

Judging from the respondents' educational level, it could be seen that most of them do not have higher education. It is important to discover their educational background since it determines the possibility of giving them knowledge and technology upgrade in regard to a more effective and efficient cultivation.



Source: processed Primary Data

Figure 2. Respondents based on educational background (%)

From figure 2, it could be seen that more than 50% of horticulture agribusinessmen have educational background below senior high-school. This

indicates that the management of agribusiness has more emphasis on the technical ability gained from generation to generation. The technical ability grows stronger as they work longer on managing agribusiness and plantation business.

Value-Added-Based Horticulture Commodity Processing System

Based on the identification of risks and Need Assessment from focus group discussion (FGD) of stakeholders, some criteria and sub-criteria which determine the horticulture commodity processing system in Gunungpati District could then be made. There are 5 criteria in this system namely Input and Cultivation, Harvest, Produce Processing, Institution and Marketing. From each of those criteria, alternative sub-criteria which constitute priorities could be made (Figure 3).

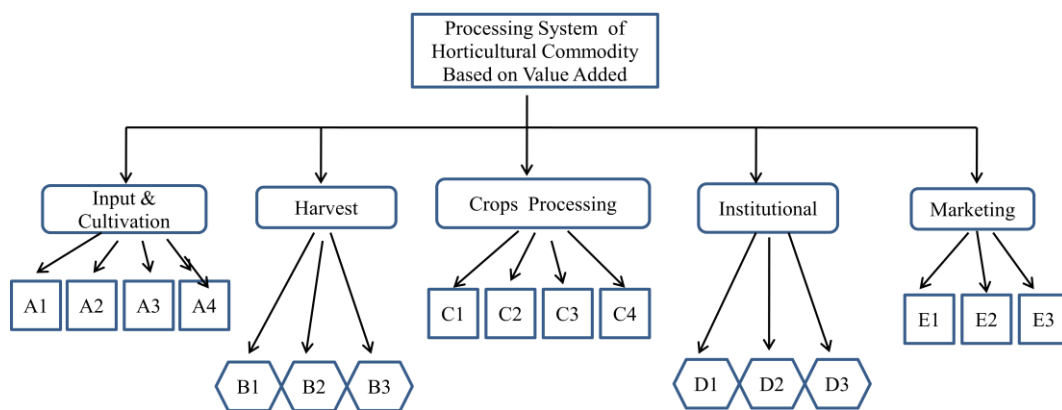


Figure 3. Alternative Criteria in Value-Added-Based Horticulture Commodity Processing System

In the criteria of Input supply (of horticulture commodity) and Cultivation there are some sub-criteria being reviewed they are; 1) Selection of superior and quality seeds (A1); 2) Proper use of fertilizers in terms of its dose and usage (A2); 3) Handling of cultivation risks (A3); and 4) Counseling and guidance from the government (A4). Then, from Input and Cultivation processes, the next stage would be value added improvement which starts from the Harvest criteria. There are several alternative sub-criteria, they are; 1) Determination of fruit criteria and quality (B1); 2) Produce sorting (B2); 3) Long-term availability of fruits (B3).

The next criteria is Produce Processing. In this criteria it can be seen that the existence of support of technology and its mastery become the sub-criteria to which the concern is addressed in determining priority in the horticulture commodity processing system later. These sub-criteria include; 1) Availability of produce processing technology (C1); 2) Innovation and diversification of processed products (C2); 3) Skills and abilities of HR (C3); 4) Post-harvest counseling and guidance (C4).

The available support of technology would influence the processed product's market entry. Therefore, institutional readiness is needed. From the Institution criteria, the sub-criteria observed are as follows; 1) Capacity of farmer groups (D1); 2) Partnership with other institutions: cooperatives and other groups (D2); 3) Managerial ability of group chief (D3).

After institutional readiness, the next criteria would be market access and relatedness (Branding, Packaging & Labeling). These criteria are highly determinants since they would be able to cause market increase and retention (market identification & business partnership). The sub-criteria to be observed are 1) Attractive packaging and labeling (E1); 2) Market information: price, competitor etc. (E2). 3) Marketing network (E3).

Analytical Hierarchy Process (AHP)

After grasping the overview of descriptive analysis, it is then followed with the analysis to determine the sequence of priority in the horticulture commodity processing using Analytical Hierarchy Process (AHP) model. As have been explained above, AHP method is used to select the criteria and their alternatives to achieve the goal.

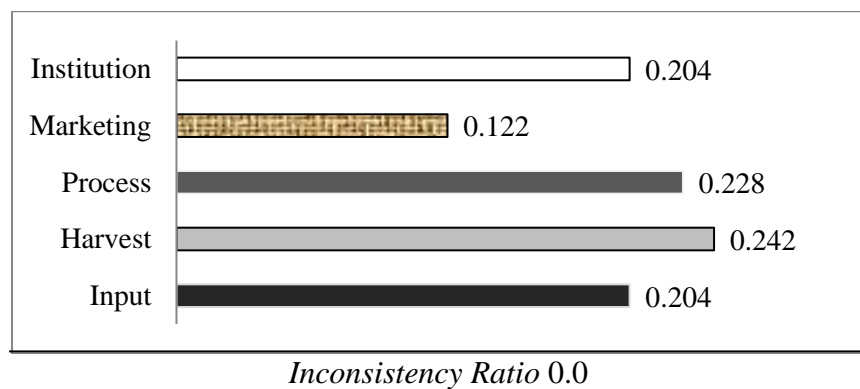


Figure 4. Criteria in Horticulture Commodity Processing System

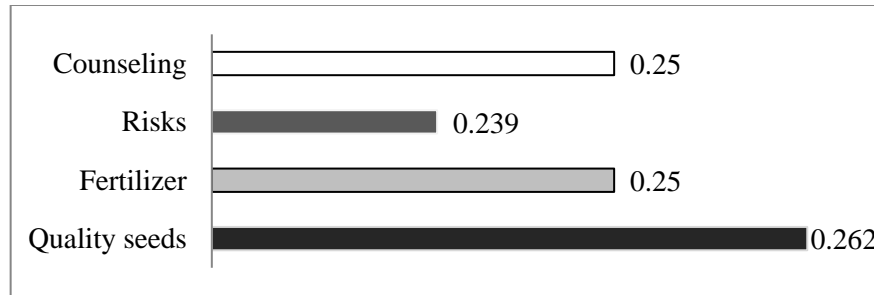
In Figure 4, it is shown that the Harvest criteria (0.242) is the most important one in this value-added-based horticulture commodity processing system. It is then followed consecutively by such criteria as Produce Processing (0.228), Input and Cultivation (0.204), Institutionalization (0.204) and Marketing (0.122). This indicates that in horticulture commodity processing system, harvest process is highly determinants to the product quality later. The first stage which needs to be considered is the determination of criteria and quality of fruits and vegetables to be harvested. The next criteria being studied is the sorting of produce. Upon sorting and cleaning, the next one is grading. This is intended to obtain good quality and identical produce in the same grade/class according to the quality standards which have been determined or requested by customers.

The harvest criteria also includes availability of fruits in market. This availability is influenced by fruit production. The problem found in the way of fruit development is the availability of lands which, in terms of their agro-climate characteristics, suit the requirement for certain fruit production development. In reality, these lands are frequently used for the production of food commodity, plantation, or other functions. A different condition is found in Gunungpati District. 30% of its land structure is Dark Brown Mediterranean and it suits very well with and has the potential for development to cultivate perennial crops, agricultural crops and *palawija* (secondary) crops. However, in reality many lands are converted into residential area. This is what happens in Gunungpati. Despite

its huge potential for fruit and vegetable production, many obstacles are in the way of its development. The tiny level of local fruit procurement makes it hard to ensure its quantity, quality, standardization, and continuity, while in facts, these factors significantly determines its competitiveness.

Input and Cultivation

Based on the Input and Cultivation criteria, the selection of superior and quality seeds in horticulture cultivation in Gunungpati District becomes the main sub-criteria.



Inconsistency Ratio 0.0

Source: Primary data (processed)

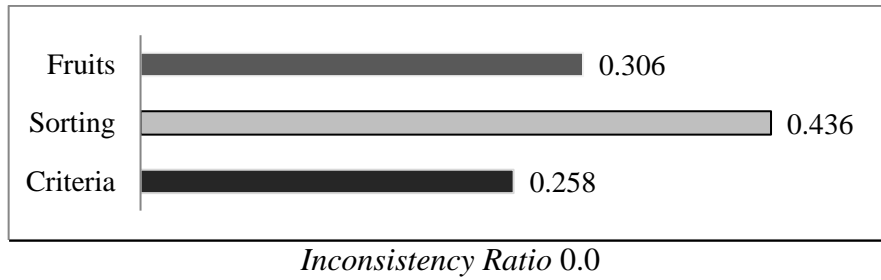
Description:

- Quality seeds : Selection of superior and quality seeds.
- Fertilizer : Proper use of fertilizer in terms of its dose and usage.
- Risks : Management of cultivation risks.
- Counseling : Counseling and guidance from the government.

Figure 5. Superior Priority in Horticulture Commodity Processing System Based on Input & Cultivation Criteria

In figure 5 it can be seen that the selection of superior, high-quality seeds has an important role to play in the effort of improving production since when these seeds are not used, the application of any other production means will be less beneficial and even may cause harms to farmers in Gunungpati District. The sub-criteria ranked second in its priority are the Proper use of fertilizer in terms of its dose and usage (0.25) and Counseling and guidance from the government (0.250). Guidance and assistance become important elements in mobilizing farmers to improve their production. By concentrating on the valuable input and resources they have, it is expected that they can strengthen and retain their unique product and bargaining position at the market (Persson, 2015).

Harvest



Source: Primary data (processed)

Description:

Criteria : Determination of fruit criteria and quality

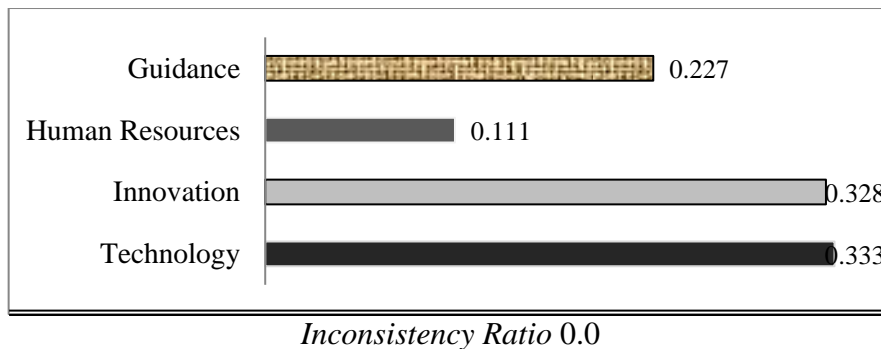
Sorting : Produce sorting.

Fruits : Long-term availability of fruits.

Figure 6. Superior Priority in Horticulture Commodity Processing System Based on Harvest Criteria

As for the harvest criteria, the most dominant sub-criteria is produce sorting (Figure 6). The sorting phase becomes critical since this is intended to obtain good quality and identical produce in the same grade/class according to the quality standards which have been determined or requested by customers. The second most important sub-criteria is long-term availability of fruits (0.306) and lastly the determination of fruit criteria and quality (0.258)

The Crops Processing



Source: Primary data (processed)

Description:

Technology : Availability of produce processing technology.

Innovation : Innovation and diversification of processed products.

Human resources : Skills and abilities of its HR.

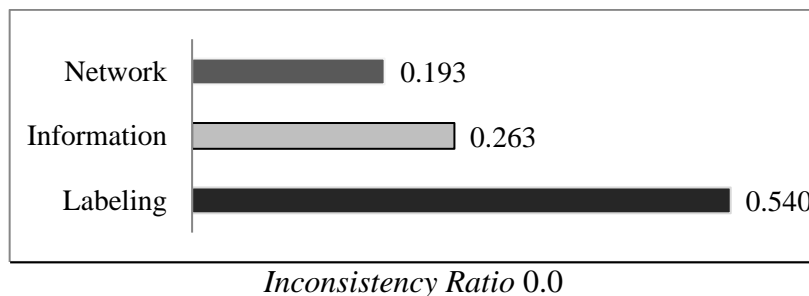
Guidance : Post-harvest counseling and guidance.

Figure 7. Superior Priority in Horticulture Commodity Processing System Based on Produce Processing Criteria

From figure 7, it can be seen that the crops processing and technology availability criteria are the highest sub-criteria at 0.333, followed by innovation and diversification of processed products (0.328). This processing technology becomes the key to improve value-added in production aspect. Members of farmer groups could perform an activity or adopt a production practice which changes the identity or quality of raw product characteristics into a product characteristic desired by customers thanks to its higher value at the market place (Lu, Ruoxi and Rebekka Dudensing, 2015).

Marketing

Attractive packaging and labeling is the most-prioritized subcriteria in the market access and relatedness aspect (Branding, Packaging & Labeling) at 0.543 (Figure 8).



Source: Primary data (processed)

Description:

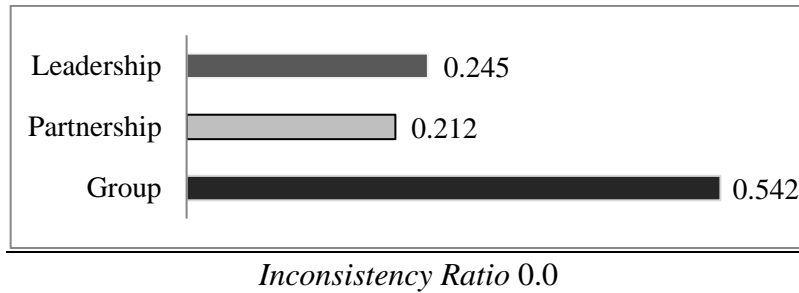
- Labeling : Attractive packaging and labeling
- Information : Market information: price, competitor, etc.
- Network : Marketing network.

Figure 8. Superior Priority in Horticulture Commodity Processing System Based on the Criteria of Marketing

The second highest priority is Market information: price, competitor etc (0.263). And the least prioritized sub-criteria is marketing network at 0.198. In Gunungpati District, packaging remains an aspect to which less attention is paid by business agents/farmers. This is inappropriate since, in addition to protect the commodity against any mechanical damage, packaging also serves the function of attracting customers and giving value added to the product and extending the product's storability. Therefore, packaging should be done carefully to avoid any extreme temperature and humidity (too high/too low), shock, vibration, friction and high pressure to the package of such produce.

Institutional

In figure 9, it is shown that the highest sub-criteria in the processing system based on Institutional criteria is capacity of farmer groups (0.543).



Source: Primary data (processed)

Description:

- Group : Capacity of farmer groups.
- Partnership : Partnership with other institutions: cooperatives and other groups.
- Leadership : Managerial ability of group chief.

Figure 9. Superior Priority in Horticulture Commodity Processing System Based on the Criteria of Institution

The operational steps practicable in the effort of strengthening farmer groups include; (Hermanto, 2011) (1) Motivating and guiding farmers to enable them to cooperate economically in groups, (2) Growing and developing farmer groups by increasing their access to capital, improving their bargaining position, facilitating and nurturing their group organization, and improving their agribusiness efficiency and effectiveness, and (3) Increasing farmers' HR capacity through such activities as assistance and training designed specifically for the management and members of farmer groups.

The result of Analytic Hierarchy Process as a whole can be seen in figure 9. In horticulture commodity processing system in Gunungpati District, there are 5 highest priorities and they could be alternative strategies to improve value added.

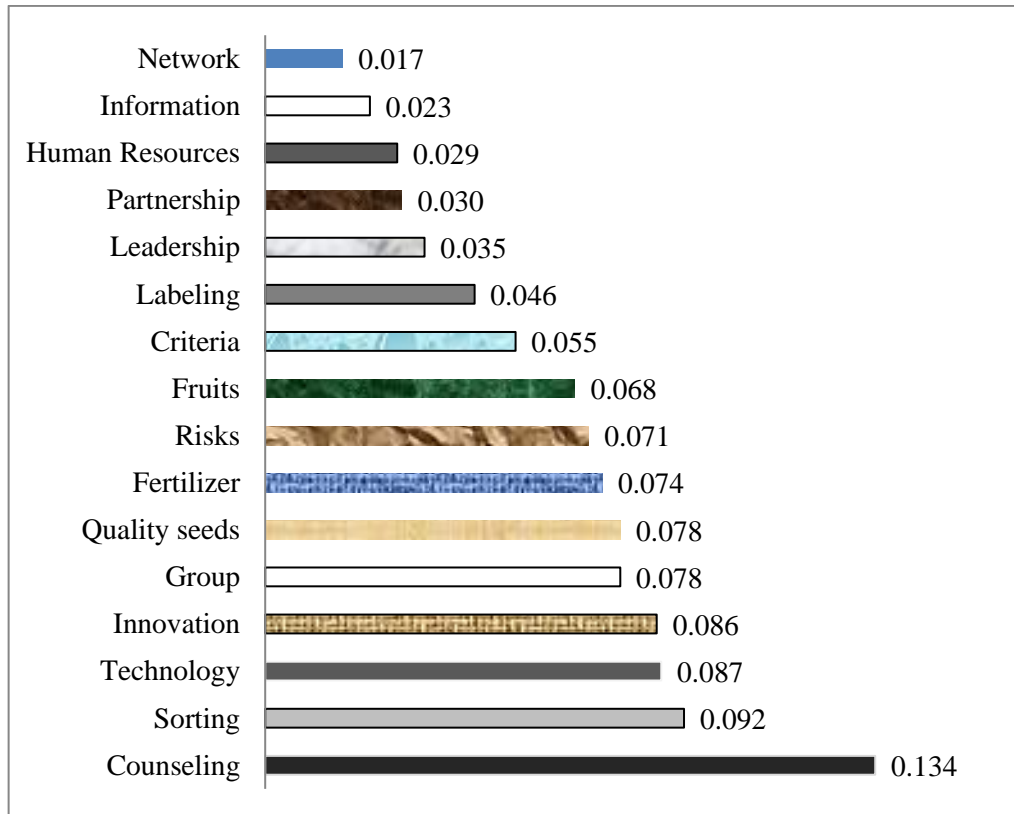


Figure 9
Sequence of alternative development priorities in added-value-based horticulture commodity processing system in Gunungpati District

In horticulture commodity processing system in Gunungpati District, there are 5 highest priorities and they could be alternative strategies to improve *value added*. These five priorities are counseling on production aspects, i.e. the counseling and guidance from the government and post-harvest counseling and guidance, at 0.134, Produce sorting (0.92), Availability of produce processing technology (0.88), innovation & diversification of processed products (0.86). The fifth priority has 2 sub-criteria which could be alternative strategies, namely selection of superior, high-quality seeds and capacity of farmer groups at an identical score of 0.78.

DISCUSSIONS

The criteria of agriculture counseling in horticulture processing system in Gunungpati District becomes the most important priority in this value-added-based commodity processing system. This is because it is no longer the time for a counseling to just teach how to farm or to transfer technology, rather it should also teach how to empower the farmers' human resources to enable them to be the real human beings as a subject of agricultural development. Most horticulture farmers in Gunungpati District do not know post-harvest processing. All they do is selling and no new innovation has been made to make their produce more varied with high sales price. Only a few vegetable and fruit farmers could

utilize well-processed produce. So far, no post-harvest technologies could compete with the pre-harvest ones, at farmers' level in particular, resulting in many produces being depreciated and undergoing undesired quality degradation.

Past experience has proven that many horticulture products lose their values or "*muspra*" (wasted) as a result of less attention being paid to post-harvest processes. For example, so huge number of rambutan in Gunungpati are wasted or deteriorate because farmers or local society do not know how to handle this overwhelming amount of rambutan production. These results reinforce the research was conducted by Pujiati, Nihayah, & Setiyani (2016). Post-harvest counseling and guidance on the way to handle horticulture produce is critical since this product in general should be consumed freshly and it is perishable. Therefore, counseling should aim at teaching how to preserve its freshness and to prevent any undesired change from occurring when it is stored to allow its development into products preferable to customers.

Meanwhile, post-harvest technology becomes the next priority since it has not been implemented well in handling horticulture product, even though it is technically easy for horticulture agribusiness agents to apply it. Post-harvest technology is still partially applied, i.e. only those with small or almost no investment costs or economically profitable, are preferred. In order to stimulate farmers' performance and counselor in the field, there is a need for agriculture policy innovation. It means government's role in agriculture innovation system is to provide fund for innovating activities and incentive for private investment and adoption of innovation and technology (OECD. 2015)

Capacity of farmer groups becomes the fifth priority and some efforts need to be done such as institutional development, empowerment and strengthening. Therefore, members of farmer groups really need to be active since in the future they will use the institution to improve their agro-business productivity in order to lift their welfare. It is expected that farmer groups will be independent, resilient, thoughtful, honest, creative, productive, emancipatory, reliable, proactive, dynamic, open-minded and responsible in dealing with every problem and facing any challenge for their own advancement.

It is confirmed by Kelly (2012) who suggests that traditional farmer organizations are one of a number of ways for organizing the supply of farmer's products through a value chain to the market and for strengthening farmers' bargaining position in the face of competition with modern farmers. When these farmer organizations reach a high level of togetherness, they will be able to deal with main obstacles related to high transaction costs, to easily penetrate marketplace and to access business and financial development services and most importantly to reactivate negotiation with their marketing chain.

CONCLUSION

The processing of horticulture commodity into various food products becomes more critical in Gunungpati District given its abundant number in every year. A holistic system to identify risk factors, to measure the risk importance starting from harvest method to produce processing to product marketing system needs to be implemented to get alternative strategies for the sake of improving value added. The research results indicate that a counseling since production to post-harvest becomes the highest priority, followed by produce sorting,

availability of produce processing technology, and innovation & diversification of processed products.

To make this value-added-based horticulture commodity processing system work, the role that the government plays in guiding and evaluating every policy priority they implement is required. In addition, there is a need for practical field-based initiatives from every productive agribusiness-man who has succeeded in making innovations and lifting their competitive strengths in order for them to have competitiveness.

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Main Priorities in Value Added Improvement-Based on Commodity Processing System

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Permalink/DOI: <http://dx.doi.org/10.15294/jejak.v10i2.11300>

Received: Juny 2016; Accepted: March 2017; Published: September 2017

Abstract

The huge number of rambutan plants in Gunungpati has resulted in the decline of rambutan sales price during harvest season, i.e. Rp 1,500.00 per pack, any unsold rambutan tends to immediately wilt, break and deteriorate. This research is aimed to the sequence of commodity processing priority in order to increase the product's value-added. This study is an action research, using descriptive statistic and Analytical Hierarchy Process (AHP). The results indicate that a counseling since production until post-harvest becomes the highest priority, followed by produce sorting, and availability of produce processing technology. It is necessary to have practical field-based initiatives of businesses farmers who have managed to do the innovations, competitive advantage, and then to rise the competitiveness. To make this value-added-based horticulture commodity processing system work, Government role is required to guiding and evaluating every policy priorities.

Key words : *priority, processing, commodity, value added, AHP.*

How to Cite: Nihayah, D., Pujiati, A., & Khoiruddin, M. (2017). Main Priorities in Value Added Improvement-Based On Commodity Processing System. *JEJAK: Jurnal Ekonomi Dan Kebijakan*, 10(2), 361-371. doi:<http://dx.doi.org/10.15294/jejak.v10i2.11300>

INTRODUCTION

Gunungpati District is a green belt for Semarang Municipality. In order to prevent any possible land function transfer, the Government of Semarang Municipality has decided to make Gunungpati District an agro-tourism area. This decision to make Gunungpati District an agro-tourism area has been in accordance with 2000-2010 Spatial Planning/RTRW of Semarang Municipality. One of the programs to deal with critical lands is *Program Konservasi Lahan Semarang Atas dan Pengentasan Kemiskinan* (PKLSAPK/Upper Semarang Land Conservation and Poverty Eradication Program) which has been implemented since 2007. In this program, cultivations of various horticulture plants are performed in Gunungpati District. Many species of plants are cultivated to save critical lands in the area.

Research on cultivations of horticulture plants in Gunungpati begins with the mapping of horticulture economic potential, which was conducted by Margunani, *et al* (2012). Their research found that land structure and contour significantly influence the distribution of horticulture plant commodities in Gunungpati. The horticulture plant species commonly cultivated are fruit crops such as durian, rambutan, jackfruit, and water apple. Meanwhile, yard long bean and red bird eye's chili are two commonly-cultivated horticulture commodities for vegetables.

Murwatiningsih (2013) conducts further research and finds that the development of post-harvest commodity of horticulture plants is still minimum and needs some reinforcement to improve their added value. These findings support Nihayah (2012) who says that any policy made should be intensive in nature such as market penetration, market development, and added value development

of the products generated from fruit crops cultivation.

In Gunungpati District, the commonly-cultivated plant commodities are jackfruit and rambutan. Rambutan is the most commonly-cultivated plant species. This plant is cultivated by 17 out of 26 farmer groups (65.4%) existing in Gunungpati District (Margunani, *et al*, 2012). When this economic potential can be managed well, its society's welfare level could increase (Nihayah, 2012). Until recently there has been no efficient post-harvest fruit and vegetable processing system. In general, fruits are sold as is. For example, during harvest season, rambutan sales price is so low, only Rp. 1,500.00-2,000.00 per pack. Due to the very low sales price of the commodity, many of the plant owners complain about how their sales could not cover the costs for picking and transporting them. Many of the produce are left to fall from the trees. Such condition shows that the low quality horticulture products are tightly related to the weak production system, harvest system, post-harvest handling, distribution, and marketing system.

During harvest time, rambutan production is overwhelming, its price is so low and any unsold rambutan will immediately wilt, break and deteriorate. The application post-harvest technology becomes the solution expected to be able to maintain, improve and increase the sales price of horticulture commodity. According to Lambert *et al* (2006), there are two ways to increase value added: (1) increasing the efficiency of production, thereby widening the margin between gross output value and the cost of intermediate inputs; (2) changing the form, function, quantity, or other product or process characteristics that increases the margin between gross output value and intermediate input cost.

An economic effort could be made in order for the fruits to be edible and to have greater value added which, in turn, would improve the

welfare of farmer groups in Gunungpati District area. The processing of horticulture commodity into a number of food products is not a priority given that its existence has been abundant each year.

Therefore, there is a need for research to create a holistic system ranging from harvest method, produce processing and product marketing system in order to increase the product's value added. The processing of agro produce could improve farmers' welfare (Watanabe, *et al*, 2009).

This study aims at determining the sequence of priority in the process of commodity processing and to develop a holistic system to identify risk factors, to measure the risk importance level, and to find an alternative strategy for value added improvement. The current research is based on the mapping made by Margunani, *et al*. (2012) which shows the potential of fruit and vegetable horticulture commodity and Murwatiningsih (2013) which forms an agro-business center for horticulture commodity in Gunungpati.

RESEARCH METHOD

The types of data used by this research are primary and secondary data. The primary data are obtained from personal interviews and Focus Group Discussion (FGD) with its key persons amounting to 25, namely farmers or vegetable and fruit horticulture agro-business agents. These key persons are selected using stratified sampling. Those farmers are divided into strata (groups) by their location (sub-districts). Such selection

by location is used considering that it is this factor which distinguishes them because every location has different structures and characteristics. The secondary data or desk study are obtained from records of Central Java BPS, Semarang Municipality BPS, Office of Food Crops and Horticulture Agriculture of Semarang Municipality and Central Java Province as well as several data literatures and publications supporting the research.

In compiling this study, descriptive quantitative and descriptive qualitative analyses are used. Analytical Hierarchy Process (AHP) is used as an analysis tool to determine the sequence of priority in the commodity processing system where the criteria are obtained by identifying the risk factors, measuring the risk importance level and needs assessment.

AHP allows the user to determine the relative weights of the criteria of a compound (or an alternative compound of a criteria) intuitively, by doing pair wise comparisons, then change the pair wise comparisons into a set of numbers that represents the relative priority of each criteria and alternatives in a consistent way. The assessment was performed by the decision makers who are experts in the field of issues that are being analyzed and who have an interest to it. Assessment criteria and alternatives do with making judgments on the relative importance between the two elements at a certain level in relation to the level above it (Setiawan, *et al*, 2014). Through pair wise comparison of elements of decision, this is done by using a rating scale (scale of 1 to 9 and the reverse).

Table 1. The 1-9 comparison scale

Intensity of relative importance	Definition	Explanation
1	Equal importance	Two activities contribute equally to the objective
3	Moderate importance of one relative to the other	Experience and judgment slightly favor one activity over another
5	Essential or strong importance	Experience and judgment strongly favor one activity over another.
7	Demonstrated importance	One activity is strongly favored, and its dominance is demonstrated in practice
9	Extreme importance	The evidence favoring one activity over another is of the highest possible order of affirmation
2, 4, 6, 8	Mean values between two close judgments	When compromise is needed
Reciprocity of the above non-zero numbers		If one activity has one of the above numbers (for example, 3), compared to the other activity, then the second activity has the reciprocal value (i.e. 1/3), when compared with the other.

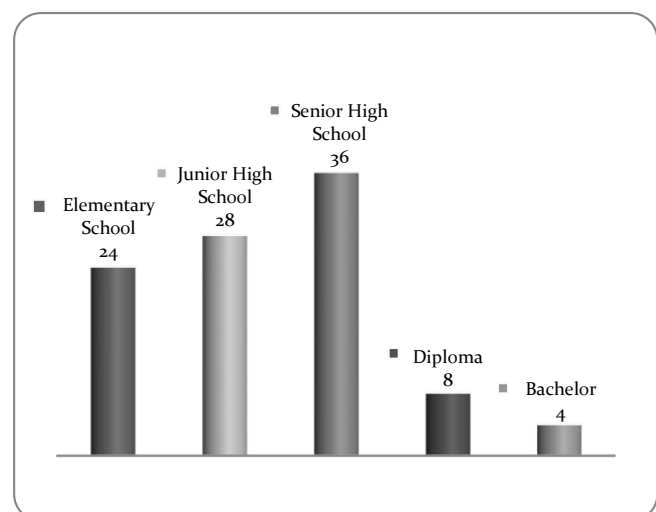
Source : Saaty & Kearns in Mimovic and Ana Krstic (2016)

Measurement of Consistency is an important characteristic of AHP. Setiawan et.al (2014) state that assessment criteria between elements with one another is not entirely consistent. AHP allows the assessment inconsistencies but should not exceed 10 %. This measurement is done by aggregating the entire eigenvector obtained from various levels of hierarchy, such that the obtained composite weighted vector which generates a sequence of decision making. Measurement consistency of a matrix based on an eigenvector maximum (λ_{max}). The closer λ_{max} obtained with n , the more consistent results.

RESULTS AND DISCUSSIONS

Gunungpati District consists of 16 sub-districts and only 13 of them have farmer groups. These sub-districts with no farmer groups are Sadeng, Kandri and Pongangan Sub-districts. In Sadeng Sub-district case, this is because the majority of population there are

factory labors because it is one of industrial zones in Semarang Municipality. Meanwhile, most of Kandri Sub-district population are ranchers and, thus, rather than a farmer group, this area has a rancher group instead.



Source: Primary data, processed

Figure 1. Respondents based on educational background (%)

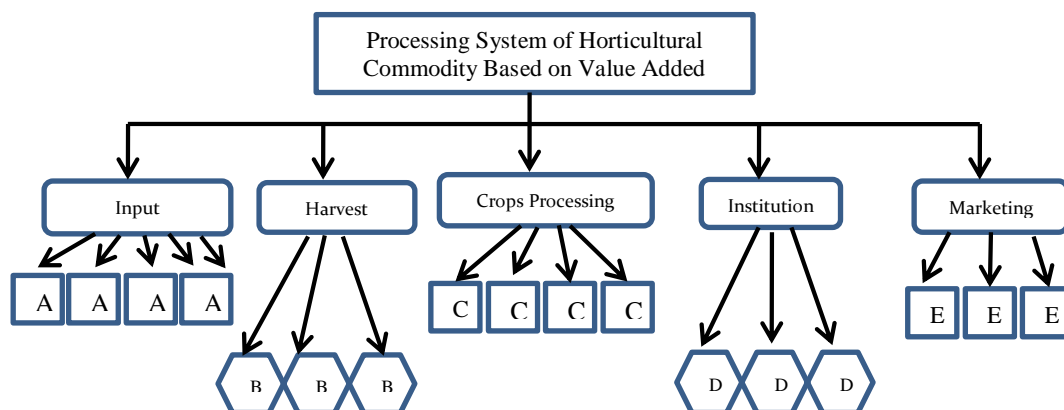


Figure 2. Alternative Criteria in Value-Added-Based Horticulture Commodity Processing System

Judging from the respondents' educational level, it could be seen that most of them do not have higher education. It is important to discover their educational background since it determines the possibility of giving them knowledge and technology upgrade in regard to a more effective and efficient cultivation.

From figure 1, it could be seen that more than 50% of horticulture agribusinessmen have educational background below senior high-school. This indicates that the management of agribusiness has more emphasis on the technical ability gained from generation to generation. The technical ability grows stronger as they work longer on managing agribusiness and plantation business.

Based on the identification of risks and Need Assessment from focus group discussion (FGD) of stakeholders, some criteria and sub-criteria which determine the horticulture commodity processing system in Gunungpati District could then be made. There are 5 criteria in this system namely Input and Cultivation, Harvest, Produce Processing, Institution and Marketing. From each of those

criteria, alternative sub-criteria which constitute priorities could be made (Figure 2).

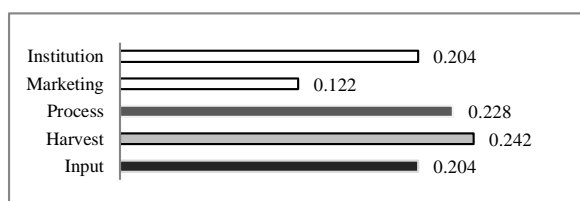
In the criteria of Input supply (of horticulture commodity) and Cultivation there are some sub-criteria being reviewed they are; 1) Selection of superior and quality seeds (A1); 2) Proper use of fertilizers in terms of its dose and usage (A2); 3) Handling of cultivation risks (A3); and 4) Counseling and guidance from the government (A4). Then, from Input and Cultivation processes, the next stage would be value added improvement which starts from the Harvest criteria. There are several alternative sub-criteria, they are; 1) Determination of fruit criteria and quality (B1); 2) Produce sorting (B2); 3) Long-term availability of fruits (B3).

The next criteria is Produce Processing. In this criteria it can be seen that the existence of support of technology and its mastery become the sub-criteria to which the concern is addressed in determining priority in the horticulture commodity processing system later. These sub-criteria include; 1) Availability of produce processing technology (C1); 2) Innovation and diversification of processed products (C2); 3) Skills and abilities of HR (C3);

4) Post-harvest counseling and guidance (C4). The available support of technology would influence the processed product's market entry. Therefore, institutional readiness is needed. From the Institution criteria, the sub-criteria observed are as follows; 1) Capacity of farmer groups (D₁); 2). Partnership with other institutions: cooperatives and other groups (D₂); 3). Managerial ability of group chief (D₃).

After institutional readiness, the next criteria would be market access and relatedness (Branding, Packaging & Labeling). These criteria are highly determinants since they would be able to cause market increase and retention (market identification & business partnership). The sub-criteria to be observed are 1) Attractive packaging and labeling (E1); 2) Market information: price, competitor etc. (E2). 3) Marketing network (E3).

After grasping the overview of descriptive analysis, it is then followed with the analysis to determine the sequence of priority in the horticulture commodity processing using Analytical Hierarchy Process (AHP) model. As have been explained above, AHP method is used to select the criteria and their alternatives to achieve the goal.



Source: Primary data, processed

Figure 3. Criteria in Horticulture Commodity Processing System

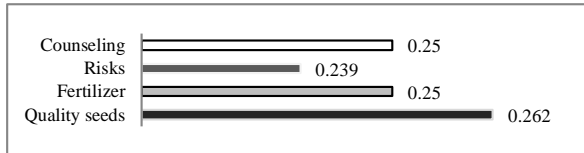
In Figure 3, it is shown that the Harvest criteria (0.242) is the most important one in this value-added-based horticulture commodity processing system. It is then followed consecutively

by such criteria as Produce Processing (0.228), Input and Cultivation (0.204), Institutionalization (0.204) and Marketing (0.122). This indicates that in horticulture commodity processing system, harvest process is highly determinants to the product quality later. The first stage which needs to be considered is the determination of criteria and quality of fruits and vegetables to be harvested. The next criteria being studied is the sorting of produce. Upon sorting and cleaning, the next one is grading. This is intended to obtain good quality and identical produce in the same grade/class according to the quality standards which have been determined or requested by customers.

The harvest criteria also includes availability of fruits in market. This availability is influenced by fruit production. The problem found in the way of fruit development is the availability of lands which, in terms of their agro-climate characteristics, suit the requirement for certain fruit production development. In reality, these lands are frequently used for the production of food commodity, plantation, or other functions. A different condition is found in Gunungpati District. 30% of its land structure is Dark Brown Mediterranean and it suits very well with and has the potential for development to cultivate perennial crops, agricultural crops and *palawija* (secondary) crops. However, in reality many lands are converted into residential area. This is what happens in Gunungpati. Despite its huge potential for fruit and vegetable production, many obstacles are in the way of its development. The tiny level of local fruit procurement makes it hard to ensure its quantity, quality, standardization, and continuity, while in

facts, these factors significantly determines its competitiveness.

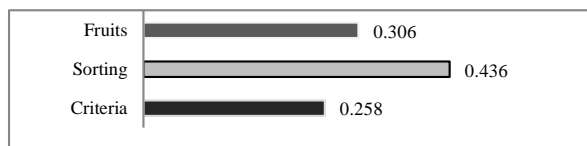
Based on the Input and Cultivation criteria, the selection of superior and quality seeds in horticulture cultivation in Gunungpati District becomes the main sub-criteria.



Source: Primary data, processed

Figure 4. Superior Priority in Horticulture Commodity Processing System

In figure 4 it can be seen that the selection of superior, high-quality seeds has an important role to play in the effort of improving production since when these seeds are not used, the application of any other production means will be less beneficial and even may cause harms to farmers in Gunungpati District. The sub-criteria ranked second in its priority are the Proper use of fertilizer in terms of its dose and usage (0.25) and Counseling and guidance from the government (0.250). Guidance and assistance become important elements in mobilizing farmers to improve their production. By concentrating on the valuable input and resources they have, it is expected that they can strengthen and retain their unique product and bargaining position at the market (Persson, 2015).



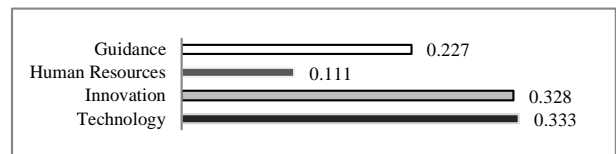
Source: Primary data, processed

Figure 5. Superior Priority in Horticulture Commodity Processing System Based on Harvest Criteria

Description:

- Criteria : Determination of fruit criteria and quality
- Sorting : Produce sorting.
- Fruits : Long-term availability of fruits.

As for the harvest criteria, the most dominant sub-criteria is produce sorting (Figure 5). The sorting phase becomes critical since this is intended to obtain good quality and identical produce in the same grade/class according to the quality standards which have been determined or requested by customers. The second most important sub-criteria is long-term availability of fruits (0.306) and lastly the determination of fruit criteria and quality (0.258).



Source: Primary data, processed

Figure 6. Superior Priority in Horticulture Commodity Processing System Based on Produce Processing Criteria

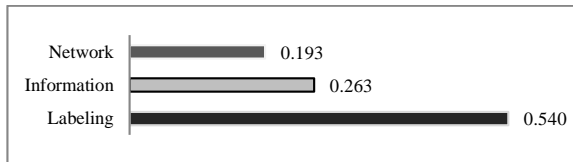
Description:

- Technology : Availability of produce processing technology.
- Innovation : Innovation and diversification of processed products.
- Human resources : Skills and abilities of its HR.
- Guidance : Post-harvest counseling and guidance.

From figure 6, it can be seen that the crops processing and technology availability criteria are the highest sub-criteria at 0.333, followed by innovation and diversification of processed products (0.328). This processing technology becomes the key to improve value-added in production aspect. Members of farmer groups could perform an activity or adopt a production practice which changes the identity or quality of raw product characteristics into a product characteristic desired by customers thanks to its

higher value at the market place (Lu, Ruoxi and Rebekka Dudensing, 2015).

Attractive packaging and labeling is the most-prioritized subcriteria in the market access and relatedness aspect (Branding, Packaging & Labeling) at 0.543 (Figure 7).



Source: Primary data, processed
Figure 7. Superior Priority in Horticulture Commodity Processing System Based on the Criteria of Marketing

Description:

- Labeling : Attractive packaging and labeling
- Information : Market information: price, competitor, etc.
- Network : Marketing network.

The second highest priority is Market information: price, competitor etc (0.263). And the least prioritized sub-criteria is marketing network at 0.198. In Gunungpati District, packaging remains an aspect to which less attention is paid by business agents/farmers. This is inappropriate since, in

addition to protect the commodity against any mechanical damage, packaging also serves the function of attracting customers and giving value added to the product and extending the product's storability. Therefore, packaging should be done carefully to avoid any extreme temperature and humidity (too high/too low), shock, vibration, friction and high pressure to the package of such produce.

In figure 8, it is shown that the highest sub-criteria in the processing system based on Institutional criteria is capacity of farmer groups (0.543).



Source: Primary data, processed
Figure 8. Superior Priority in Horticulture Commodity Processing System Based on the Criteria of Institution

Description:

- Group : Capacity of farmer groups.
- Partnership : Partnership with other institutions : cooperatives and other groups.
- Leadership : Managerial ability of group chief.

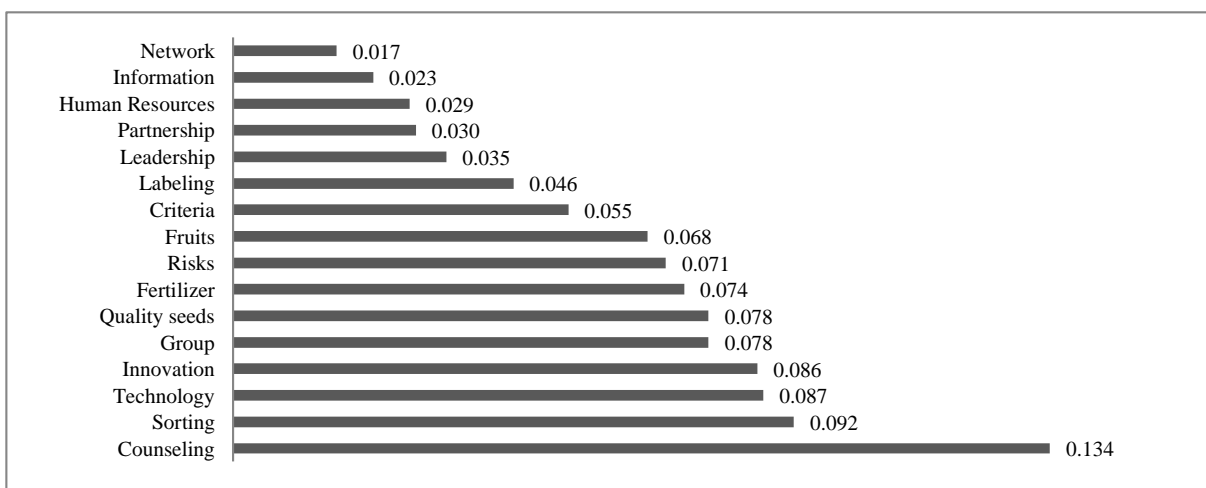


Figure 9. Sequence of alternative development priorities in added-value-based horticulture commodity processing system in Gunungpati District

The operational steps practicable in the effort of strengthening farmer groups include; (Hermanto, 2011) (1) Motivating and guiding farmers to enable them to cooperate economically in groups, (2) Growing and developing farmer groups by increasing their access to capital, improving their bargaining position, facilitating and nurturing their group organization, and improving their agribusiness efficiency and effectiveness, and (3) Increasing farmers' HR capacity through such activities as assistance and training designed specifically for the management and members of farmer groups.

The result of Analytic Hierarchy Process as a whole can be seen in figure 9. In horticulture commodity processing system in Gunungpati District, there are 5 highest priorities and they could be alternative strategies to improve value added.

In horticulture commodity processing system in Gunungpati District, there are 5 highest priorities and they could be alternative strategies to improve *value added*. These five priorities are counseling on production aspects, i.e. the counseling and guidance from the government and post-harvest counseling and guidance, at 0.134, Produce sorting (0.92), Availability of produce processing technology (0.88), innovation & diversification of processed products (0.86). The fifth priority has 2 sub-criteria which could be alternative strategies, namely selection of superior, high-quality seeds and capacity of farmer groups at an identical score of 0.78.

The criteria of agriculture counseling in horticulture processing system in Gunungpati District becomes the most important priority in this value-added-based commodity processing system. This is because it is no longer the time for a counseling to just teach

how to farm or to transfer technology, rather it should also teach how to empower the farmers' human resources to enable them to be the real human beings as a subject of agricultural development. Most horticulture farmers in Gunungpati District do not know post-harvest processing. All they do is selling and no new innovation has been made to make their produce more varied with high sales price. Only a few vegetable and fruit farmers could utilize well-processed produce. So far, no post-harvest technologies could compete with the pre-harvest ones, at farmers' level in particular, resulting in many produces being depreciated and undergoing undesired quality degradation.

Past experience has proven that many horticulture products lose their values or "*muspra*" (wasted) as a result of less attention being paid to post-harvest processes. For example, so huge number of rambutan in Gunungpati are wasted or deteriorate because farmers or local society do not know how to handle this overwhelming amount of rambutan production. These results reinforce the research was conducted by Pujiati, Nihayah, & Setiyani (2016). Post-harvest counseling and guidance on the way to handle horticulture produce is critical since this product in general should be consumed freshly and it is perishable. Therefore, counseling should aim at teaching how to preserve its freshness and to prevent any undesired change from occurring when it is stored to allow its development into products preferable to customers.

Meanwhile, post-harvest technology becomes the next priority since it has not been implemented well in handling horticulture product, even though it is technically easy for horticulture agribusiness agents to apply it. Post-harvest technology is still partially applied, i.e. only those with small or almost no investment costs or economically profitable, are preferred. In

order to stimulate farmers' performance and counselor in the field, there is a need for agriculture policy innovation. It means government's role in agriculture innovation system is to provide fund for innovating activities and incentive for private investment and adoption of innovation and technology (OECD. 2015)

Capacity of farmer groups becomes the fifth priority and some efforts need to be done such as institutional development, empowerment and strengthening. Therefore, members of farmer groups really need to be active since in the future they will use the institution to improve their agro-business productivity in order to lift their welfare. It is expected that farmer groups will be independent, resilient, thoughtful, honest, creative, productive, emancipatory, reliable, proactive, dynamic, open-minded and responsible in dealing with every problem and facing any challenge for their own advancement.

It is confirmed by Kelly (2012) who suggests that traditional farmer organizations are one of a number of ways for organizing the supply of farmer's products through a value chain to the market and for strengthening farmers' bargaining position in the face of competition with modern farmers. When these farmer organizations reach a high level of togetherness, they will be able to deal with main obstacles related to high transaction costs, to easily penetrate marketplace and to access business and financial development services and most importantly to reactivate negotiation with their marketing chain.

CONCLUSION

The processing of horticulture commodity into various food products becomes more critical in Gunungpati District given its abundant number in every year. A

holistic system to identify risk factors, to measure the risk importance starting from harvest method to produce processing to product marketing system needs to be implemented to get alternative strategies for the sake of improving value added. The research results indicate that a counseling since production to post-harvest becomes the highest priority, followed by produce sorting, availability of produce processing technology, and innovation & diversification of processed products.

To make this value-added-based horticulture commodity processing system work, the role that the government plays in guiding and evaluating every policy priority they implement is required. In addition, there is a need for practical field-based initiatives from every productive agribusiness-man who has succeeded in making innovations and lifting their competitive strengths in order for them to have competitiveness.

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