Exploration and identification of aren plant 
(*Arengapinnatamerr*) in district of South Tapanuli

M Khairiyah* and P Harahap

Study Program of Agrotechnology, Faculty of Agriculture, Universitas Graha Nusantara Padang Sidimpuan, Kampus I Tor Simarsayang, Padang Sidimpuan, Indonesia

E-mail: *khairiyahharahap85@gmail.com or parmabona12@gmail.com

Abstract. The purpose of research is to know the diversity of accession of sugar *Arenga* in South Tapanuli Regency and to classify the population drilling to get the high production. Eighty accessions of *Arenga* populations from four sub districts have been identified according to IPGRI. The results show that formation of 4 targeted clusters that cluster 1 is a collection of accession *Arenga* with phenotypic character more suitable in producing fruit from female groups. While cluster 3 is a group accession *Arenga*, the appropriate phenotypes character will produce nira (raw material of *Arenga* sugar) from male flowers.

1. Introduction
Regency of South Tapanuli is one of the regencies in province of North Sumatera. The capital of the district is Sipirok and it was divided into 14 (fourteen) districts with an area of 4,498.81 km². The forestall area is 249,452 ha and agricultural uses is 53,231 ha [2]. Among the agricultural areas, annual crops are still dominated by rubber, oil palm, cocoa, coffee, and salak. While aren plants (*Arengapinnata Merr*) are still rarely grow and almost spread throughout the society’s area around the Regency [2].

This palm plant is a potential local wisdom that deserves to be developed. However, this plant are still prioritized as an additional income beside of their main income in accordance with the major cultivated commodity. This plant is unique because it has a promising economic value, ranging from the roots to the midrib and essentially gives an important role which passed down through generations to the local people (seeker). Palm growth is still based on natural affection for farmers, because there has been no treatment from farmers on the palm sugar. In addition, there is no programmed development steps to foster the product from the farming at the same time [6].

The main constrain faced in developing of the production of juice and palm sugar in South Tapanuli Regency are: 1). The cultivated palm plants are rarely growing, so there is no cultivation technique applied, 2). Lack of knowledge related to cultivation, so the plants grow and produce with minimum, 3). Limited knowledge about the types and diversity of palm plant cultivars and their superior properties, 4). The high diversity of species and the extent of population distribution make it more difficult to know the character which affects the production of juice and palm sugar, 5). The low production of nira from palm trees caused the minimum yield of aren sugar [3].

The massive spread of population which inline to high diversity of the plants had caused the prediction or estimation of nira yield [4]. Todate, there’s no datas and information which explained...
about the phenotype profiles of productive aren, especially the production of nira as raw material for making aren sugar in South Tapanuli Regency.

This study aims to find out and to obtain the diversity of aren’s accessions rearing in South Tapanuli Regency.

2. Materials and Methods
Research was conducted with a survey method which is an exploratory way by exploring and collecting some various accessions [1] of palm plants and located in two villages of four districts at South Tapanuli Regency.

The stages in this study were carried out in three stages. The first stage is exploration with survey method, which is handled with purposive sampling; sampling technique to be focused based on the existing criteria around the spot sample.

The second stage is identification and characterization based on the character of the plant phenotype according to IPGRI [5] by observing individual plant objects. IPGRI has not issued a palm plant descriptor list because palm sugar plants are not familiar for cultivating, but this is not a problem or obstacle to be pushed in identifying the phenotypic characters of palm plantations because IPGRI has issued a descriptor list of coconut plants which are one family with palm sugar, the descriptor list of these coconut plants which is used as a guide and reference and modified according to the need to be able to identify and characterize palm trees.

The third stage is data analysis. Data obtained from the field are described descriptively. Furthermore, data analysis was carried out with statistical analysis to see the suitability of the data if factored using factor analysis and cluster analysis.

3. Results and Discussion
Obtained 53 phenotypic characters observed according to the IPGRI descriptor list. Factor analysis was carried out to find out the characters that caused phenotypic diversity so that there were 32 phenotypic character variables which were reduced to 6 formed factors. Factor 1; The number of females, the length of the female stem, the circumference of the female stem, the length of the female breed, the number of females can affect the number of fruits per series, the number of fruits per female, fruit length, fruit circumference and fruit weight per seed. The more female flowers, the longer and larger the stem circumference, and the longer and more female flower arrangements, the more fruit and the weight of palm trees. Factor 2; The number of males, the length of the male stems, the circumference of the male stalk, the number of males, the length of the male may affect the sugar content of the juice. The more male flowers, the longer and larger the circumference of the stalk, and the more and longer the range of male flowers, the greater the sugar content of the juice of the sap tapped by farmers. Factor 3; The number of leaflets in pairs can affect the length of the rachis. The more number of children with leaves in pairs, the longer the rachis of palm trees. Factor 4; Petiole length can affect the amount of fruit per female. The longer the petiole of palm trees, the more fruit the palm trees have. Factor 5; The number of productive leaves can affect the yield or production of juice. The more productive leaves that palm trees have, the higher the production of juice produced. Factor 6; Petiole circumference can affect the colour of the bark. The larger or smaller the petiole circumference, the bark colour will be different.

The results of cluster analysis in Figure 1.show the similarity and diversity of the phenotypic characters based on Euclid distance, thus forming 4 major clusters of 80 palm accessions identified. Cluster 1, is a group of palm accessions with phenotypic characters that are suitable for producing fruits from female flowers. The accessions are 6 accessions in Sinyior Village (South of Angkola Subdistrict), 5 accessions in Sitataroit Village (West of Angkola Subdistrict), 2 accessions in Pasar Sempurna Village and 8 accessions in Aek Sabaon Village (Marancar Subdistrict), 3 accessions in Baringin Village and 1 accession in Parau Sorat Village (Sipirok District).
Figure 1. Dendogram results from the analysis of 80 palm sugar clusters

Cluster 2, is a group of palm accessions with phenotypic characters that do not have female flowers. The accessions are 2 accessions in Sinyior Village and 3 accessions in Situmbaga Village (South of Angkola District), 2 accessions in Sitaratoit Village and 4 accessions in Pagaran Village (West of Angkola District), 1 accession in Pasar Sempurna Village and 1 accession in Aek Sabaon Village (Marancar Subdistrict), 4 accessions in Baringin Village and 3 accessions in Parau Sorat Village (Sipirok Subdistrict)
Cluster 3 is a group of palm accessions with phenotypic characters that are suitable for producing sap (raw material for palm sugar) from male flowers. The accession is 1 accession in Sinyior Village and 7 accessions in Situmbaga Village (South of Angkola Subdistrict), 3 accessions in Sitaratoit Village and 6 accessions in Pagaran Village (West of Angkola District), 7 accessions in Pasar Sempurna Village and 1 accession in Aek Sabaon Village (Marancar Subdistrict), 2 accessions in Baringin Village and 6 accessions in Sorat Village (Sipirok Subdistrict).

Cluster 4, is a group of palm accessions with phenotypic characters that do not have male flowers. The accession is 1 accession in the Village of Sinyior (South of Angkola) and 1 accession in the Village of Baringin (Sipirok).

4. Conclusions
The results of exploration and identification of 80 sugar palm accessions in 4 sub-districts in South Tapanuli Regency have varied diversity and there are 4 main groups with a similarity level of 75% or a diversity of 25%.

References
[1] Amilda Y 2014 Eksplorasi Tanaman Pisang Barangan (Musa acuminata) Di Kabupaten Aceh Timur [Exploration of Barangan Banana plant (Musa acuminata) in East Aceh] [Thesis] (Medan: Agroecotechnology Department, Universitas Sumatera Utara)
[2] Badan Pusat Statistik Kabupaten Tapanuli Selatan [Statistics Agency of South Tapanuli] 2016 Kabupaten Tapanuli Selatan Dalam Angka [Regency of South Tapanuli in Figures] (South Tapanuli: Statistics Agency) http://tapanuliselatankab.bps.go.id
[3] Harahap D E 2013 Kajian produktivitas tanaman aren berdasarkan status hara tanah dan morfologi tanaman pada skuen tinggi tempat di kabupaten tapanuli selatan [Productivity of aren plants based on morphological properties of plants in high skuen place in Saouth Tapanuli] J. Pertanian Tropik 2 pp 161-70
[4] Khairiyah M 2013 Analisis Keragaman Genetik Tanaman Aren (Arenga pinnata Merr) di Tapanuli Selatan dengan Menggunakan Marka RAPD (Random Amplified Polymorphic DNA) [Analysis of Genetic Diversity of Aren (Arenga pinnata Merr) in South Tapanuli by Using RAPD (Random Amplified Polymorphic DNA)] [Thesis] (Medan: Agroecotechnology Department, Universitas Sumatera Utara)
[5] IPGRI 1995 Descriptors for Coconut (Cocos nucifera L) (Roma: International Plant Genetic Resources Institute) http://indoplasma.or.id/deskriptor.htm.
[6] Pulungan S 2015 Analisis pengembangan agroindustri gula aren dan gula semut di Kabupaten Tapanuli Selatan [Analysis of development of agroindustry of palm sugar and ants sugar in South Tapanuli District] Grahatani Opini 1 pp 58-65

Acknowledgments
This research was funded by the Ministry of Research, Technology and Higher Education Republic of Indonesia through the beginner lecturer grant research at 2018.