

Efforts to develop the potential of minor vegetables

Upaya mengembangkan potensi sayuran minor

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Abstrak. Widyawati AT dan Zuchy T. 2018. *Upaya mengembangkan potensi sayuran minor. Pros Sem Nas Masy Biodiv Indon 5: 117-122.* Program penelitian sayuran hingga kini masih menitikberatkan pada beberapa komoditas sayuran prioritas seperti cabai merah, bawang merah, kentang, kubis, dan tomat yang dipilih berdasarkan justifikasi luas areal panen dan kontribusi produksinya. Sementara itu, kenyataan di lapangan menunjukkan bahwa berbagai komoditas sayuran minor masih tetap dimanfaatkan di masyarakat, walaupun cenderung dalam skala kecil dan bersifat spesifik lokasi. Di sisi lain, kenyataan yang terjadi menunjukkan bahwa perhatian publik, khususnya dari sisi penelitian terhadap kelompok sayuran ini masih sangat minimal, bahkan cenderung terabaikan. Akibatnya, keberadaan kelompok sayuran minor ini mulai terancam karena digantikan oleh beberapa spesies kultivasi. Bila dikaitkan dengan isu pengembangan sayuran minor, maka upaya untuk mengangkat potensi manfaat sayuran minor agar dapat sejajar atau bersaing dengan sayuran mayor yang telah berkembang terlebih dahulu merupakan suatu keharusan. Dalam hal ini, konsep pemasaran harus berorientasi pada kepentingan konsumen (berfokus pada pasar), berorientasi pada kebutuhan dan keinginan konsumen, sehingga kepuasan konsumen dapat tercapai. Sayuran minor yang bernilai ekonomi dan memiliki potensi untuk dikembangkan adalah Kenikir (*Cosmos caudatus* Kunth), Genjer (*Limnocharis flava* (L.) Buchenau), Poh-pohan (*Pilea melastomoides* (Poir.) Bl.), dan Leunca (*Solanum americanum* Miller). Peran memanfaatkan sayuran minor untuk membantu mengatasi masalah gizi di Indonesia, terutama untuk keluarga pra sejahtera, dapat diandalkan karena sayuran minor telah beradaptasi dengan lingkungan lokal dengan cara budidaya yang mudah dan biaya rendah. Namun demikian sayuran minor masih membutuhkan studi lebih lanjut mengenai nilai ekonomi, kandungan nutrisi potensial, serta prospek pengembangannya.

Kata kunci: *Cosmos caudatus*, Genjer, leunca, kenikir, *Limnocharis flava*, *Pilea melastomoides*, poh-pohan, sayuran minor, *Solanum americanum*

Abstract. Widyawati AT, Zulchi T. 2018. *Efforts to develop the potential of minor vegetables. Pros Sem Nas Masy Biodiv Indon 5: 117-122.* Research program on vegetables to date is still focusing on several priority commodities such as red chili, onion red, potatoes, cabbage and tomatoes in consideration of harvested areas and its contribution to production. Meanwhile, the reality in the field show that various commodities minor of minor vegetable are still used in society, although it tends to be on a small scale and locally specific. On the other side, the reality happened shows that public attention, in particular in terms of on this vegetable groups is still very minimal, even inclined neglected. As a result, the existence of groups are threatened because they are replaced by several cultivation species. When associated with development issues minor vegetables, then an attempt to lift the potential benefits of minor vegetables to be equal or compete with major vegetables that have been developing is a must. In this case, the concept of marketing must be consumer oriented (market-focused), oriented on the needs and desires of consumers, so that customer satisfaction can be achieved. These following minor vegetables are of economic value and have a potential to be developed : Kenikir (*Cosmos caudatus* Kunth), Genjer (*Limnocharis flava* (L.) Buchenau), Poh-pohan (*Pilea melastomoides* (Poir.) Bl.), and Leunca (*Solanum americanum* Miller). Minor vegetables have role to help for overcoming nutritional problems in Indonesia, especially for pre-family prosperous, because it have been adapted to the local environment by means of easy cultivation and low cost. However minor vegetables still require a study on their economic values, potential nutritional content as well as its prospects to be developed as a promising commodities.

Keywords: *Cosmos caudatus*, *Limnocharis flava*, minor vegetables, *Pilea melastomoides*, *Solanum americanum*

INTRODUCTION

Around the world, more than 1,000 plants are used as vegetables, and about 350 of them are used on a large scale. Vegetable plants are often distinguished by parts of plants that can be eaten, namely leaves, buds, roots, tubers, sprouts, flowers, fruit, and seeds (Morico et al. 1998). Of

all the biodiversity available in the world, which is around 250,000 species, only 32 species are categorized as important plants and only 20 species are staple foods, both in developed and developing countries. It is difficult to imagine that the very small selection (from the total available genetic resources) can meet the food needs of around 5 billion of the world's population (Wilcove et al.

1993). This illustrates that minor vegetables can also contribute to overall food supply (Babu 2000). However, the fact also shows that the existence of this group of indigenous vegetables began to be threatened because it was replaced by various species of cultivation.

In contrast to major vegetables that have been taken seriously, both by public and private institutions, the minor vegetable group tends to remain neglected. Most of the research concerns only production systems involving several vegetable species that are economically important. Meanwhile, the potential role of minor vegetables in an effort to realize Sustainable agriculture through diversification of uses that support biodiversity conservation and its contribution to meeting vegetable supply throughout the year, has not yet been fully explored. Therefore, activities research aimed at increasing the utilization of minor vegetables has a strategic value that needs greater attention. Implicitly, this illustrates that the conservation of genetic resources of minor vegetables is indeed an important issue. However, the real challenge is how to raise the potential benefits of minor vegetables so that they can align or compete with major vegetables that have developed beforehand (AVRDC 1999).

Research program on vegetables to date is still focusing on several priority commodities such as red chili, onion red, potatoes, cabbage and tomatoes selected based in consideration of harvested areas and its contribution to production. Year statistics 2008 shows that red chili harvest areas ranks first (10.63%) of the total vegetable harvested areas in Indonesia, while onion, potatoes, cabbage, and tomatoes rank third (8.89%), fourth (6.25%), fifth (5.99%), and ninth (5.17%), respectively. In terms of its contribution to national production of vegetables, cabbage ranks first (13.19%), and in sequence the fifth is occupied by potatoes (10.68%), shallots (8.51%), tomatoes (7.23%), and red chili (6.93%) (Directorate General of Horticulture, 2009). Meanwhile, the reality in the field show that various commodities of minor vegetable are still used in society, although it tends to be on a small scale and specific local. Nevertheless, its utilization by small farmers still has comparative advantage (Marsh, 1998), and can help small farmers to reduce risk and diversifying output in connection with fluctuations in the prices of major vegetables. This matter illustrates that minor vegetables can contribute to the food supply as a whole (Babu 2000).

When associated with development issues minor vegetables, then an attempt to lift the potential benefits of minor vegetables to be equal or compete with major vegetables that have been developing first is a must. Development of vegetable groups this is not only planned carefully from production side, but also must be considered on its marketing feasibility aspects (Felker, 1996; O'dell et al. 1996). In this case, the concept marketing must be interest oriented consumer (market-focused), oriented on the needs and desires of consumers, so that customer satisfaction can be achieved.

Minor vegetables

Currently, the need for vegetables is increasing due to the increasing of population. Therefore, the availability of

vegetables is quite necessary to be able to meet the community needs. Vegetables that can be consumed not only vegetables that have been widely known to public, because there are actually more than a hundred species vegetables that are cultivated in the area tropics that are still unknown by community or commonly referred to as minor vegetables or local vegetables (Williams et al. 1993).

Minor vegetables are usually defined as native or traditional vegetables (Kusmana and Suryadi 2004) it include also introduced species that have been cultivated over a long period (Engle and Faustino 2007). They are offered at an affordable price and have a distinct flavor, thus contributing greatly to farmer's economy, diet and social relations. Minor vegetables are part of biodiversity and Indonesia is included among three mega biodiversity countries after Brazil and Madagascar (Baihaki 2003). However, so far very lack attention on minor vegetables, even tend to be abandoned, both in terms of research and development at the community level (Bermawie 2006; Somantri 2006), as a result, existence this group of minor vegetables began to be threatened extinction, and there is a tendency to be replaced by several species of cultivation (Adiyoga et al. 2002). The threat and at the same time endanger the status of existence of local knowledge related to cultivation, utilization and conservation of minor vegetables. This fact is in line with the results Cromwell (1999) which showed that, in recent years the genetic diversity status of vegetable crops globally experienced sufficient highly genetic erosion. Meanwhile, various other studies also shows that local knowledge and technology are able to contribute to the preservation of natural resources (Adimihardja 2003).

Because the existence of underdevelopment minor vegetables is indicated by quality attributes possessed by commodities, it is relatively not comparable/parallel to priority vegetable such as potatoes, red onions, red chili, cabbage and tomatoes. In addition, the economic value of minor vegetables in entering market is also lower comparing to main/major vegetables (Adiyoga et al. 2008). However it is deep in fact some types of minor vegetables are still used by community, though in portions that are not too large and are locally specific (Guarino 1997 in Nnamani et al. 2009) Minor vegetables also has highly resistance to pathogens and adaptable with an unfavorable environments, so can be used as a substitute for commercial vegetables in supplying nutritional needs (Chen 1999).

Development of minor vegetables

Development of minor vegetables needs to get even greater attention based on the considerations that (i) this vegetable group is still categorized as under-utilized and tends to be neglected, although it has potential as an alternative of relatively cheap protein, vitamins, minerals, and fiber; (ii) the exploitation/production of minor vegetable groups by small farmers will give higher comparative advantage comparing to the one of major vegetables; (iii) the exploitation/production of minor vegetable groups can help small farmers to reduce risk and diversify output due to price fluctuations, in major

vegetable; (iv) this group of vegetables belongs to a species which is under threat and needs to be conserved, and (v) this group of vegetables has a potential to be developed as new cultivars with particular characteristics, especially associated with major vegetable markets that are starting shows symptoms of saturation (Tripp 1996).

In total, the development of commodities, such as minor vegetables, must not only be carefully planned from the production side, but also must be considered on the aspects of marketing feasibility (O'dell et al. 1990; Felker 1996). Some things that need to be observed in connection with efforts to raise the potential benefits of minor vegetables, in order to be equal or compete with major vegetables that have developed before, including (i) consumption trends, (ii) consumer behaviors, (iii) marketing channels, and (iv) the level of market competition for similar commodities/products. In order for optimal marketing of these commodities, these factors need to be dealt by marketing strategies that include (i) product diversification, (ii) geographical diversification, (iii) brand determination, (iv) promotion and advertising, (v) pricing, and (vi) consumer information (Kleinschmidt and Robert 1991).

Types of potential minor vegetables to develop

The abundance of abundant species and sources of native Indonesian minor germplasm has not been utilized optimally. This is seen among others by the number of imported vegetables circulating in various cities in Indonesia. Therefore, the abundant biological resource wealth in Indonesia needs to be utilized to the maximum extent possible to meet food needs, especially vegetables. The following is described minor vegetables that are of economic value and have the potential to be developed

Kenikir (*Cosmos caudatus* Kunth)

Kenikir (*Cosmos caudatus* Kunth) is mainly intercropped with vegetables commercially-cultivated worldwide (hereafter designated “common vegetables”) such as leek, cabbage and lettuce at high altitudes, and with sweet corn and long beans at low altitudes. Many farmers grow kenikir as border plants along planting beds of common vegetables because they believe that it can reduce soil diseases and pests such as nematode (Santosa et al. 2015).

Kenikir is one type of potential minor vegetables to developed as an alternative vegetables that can meet nutritional needs (protein, vitamins and minerals) and market demand, and can be efficacious as a traditional medicine because some minor vegetables contain essential oils that are good for health (Amsya et al. 2017).

Kenikir is a seasonal or annual herbaceous plant, upright trunk with a height of up to 3 m. The stem is rectangular, grooved, branched, and purplish green. Compound misty leaves, cross-faced, pinnate shape, pointed tip, flat edge, dark green on the upper surface and lighter color, and slightly hairy on the lower surface leaf. Flower of kenikir is located at the top of plant. Flower stalk length is around 5-30 cm, the flower crown is yellow and consists of 8 strands length 1.5-2 cm. Kenikir seeds are

brown and needle-shaped with hairy ends (Van den Bergh 1994a).

Kenikir plants are propagated by using seeds. Sowing seeds can be done directly in the field or in the nursery first. Seeding carried out for about 3 weeks then can be transplanted in the land with a distance between planting 25 cm × 30 cm. Organic fertilizer 10 tons ha⁻¹ and urea 200 kg ha⁻¹ in nutrient-poor soils can be given to increase yields and improve leaf quality. Sufficient irrigation is important for the growth of the kenikir (Van den Bergh 1994a).

Van den Bergh (1994a) considered that kenikir can improve soil structure and suppress some weeds, including *Imperata cylindrica*. Only few farmers cultivate kenikir on their farms as main crop. They dedicated 200 to 2500 m² specially for growing the kenikir. In commercial kenikir farms, seeds are sown in beds and raised for one to two weeks. Then seedlings are transplanted in a square pattern, e.g., 25 cm × 25 cm. Goat manures are applied at planting, while mineral fertilizers are rarely applied to kenikir. Some farmers apply nitrogen (urea 46% N) at a rate of 1-2 g per plant along with goat manure. When inflorescences emerge six to eight weeks after planting, edible parts of kenikir, i.e., leaves, young shoots and inflorescences, are harvested for the first time. Farmers usually continue to harvest new offshoots until six months after planting, although some farmers replant new seedlings after only one harvest. According to Van den Bergh (1994a), harvesting could be continued for two to three years after planting, but most farmers preferred to stop harvesting within six months after planting, possibly because plants could be infested by diseases during dry season.

Research done by Lotulung et al. (2005), showed that kenikir leaves contains highly sufficient antioxidant at IC50 value of 70 mg/l. Abas et al. (2003) mentioned that Methanolic extract of kenikir leaves contains flavonoids and glycosides quercetin.

Genjer (*Limnocharis flava* (L.) Buchenau)

Genjer (*Limnocharis flava* (L.) Buchenau) was introduced into Southeast Asia from tropical and subtropical America, and naturalized in Indonesia, Malaysia and Thailand (Van den Bergh 1994b). Genjer grows naturally in lowlands such as swampy land, paddy field, riverbank and fish ponds with water level less than 20 cm. Genjer plants cannot grow in ponds of which water depth is over 30-40 cm. Genjer plants are propagated either by seeds or vegetative through suckers. Edible parts of genjer are the peduncles, petioles, leaf blades and the unopened inflorescences.

Usually, farmers harvest genjers that grow wild in the fields for their own needs or to sell it to local markets. Generally, genjer cultivation has not been commonly done; although there are also farmers in some areas such as in Kuningan and Bogor, who deliberately plant it in the fields on a small scale (around 2 m² on the edge of the paddy field or in shallow ponds).

Although not yet publicly cultivated, the field observations done in 2011 showed that some farmers in Sukadarma village and Sukamulya village, Sukatani district, Bekasi, cultivated genjers on a broad scale (Juhaeti

et al. 2011). In both villages there are large areas of genjer cultivation reaching about 30 ha. Parts of genjer plant to be vegetatively propagated is the flower. One bunch of genjer flowers (one bundles = one handful of adults) valued at 400-500 rupiah. Commonly farmers can produce 200-300 bunches in the first harvest season, then this number increases to 2000 bundles/day. The first harvest is done at 1 (one) month after planting, then the next harvesting is done every week. Genjer farmers in the area are able to reap gross profits up to 2 million per week from 1 hectare genjer plantations. Plant rejuvenation is carried out after one year of plant life.

On the other side, various research results showed that genjers plants have ability to accumulate heavy metals and other pollutants (Hidayati et al. 2009; Haryati et al. 2012; Rachmadiarti et al. 2012; Juhaeti et al. 2009). However, it needs to be considered a good way for cultivating genjer so that a healthy product can be obtained by consumers. This needs to be considered, so consumers get a decent generator for consumption and free from heavy metals and other pollutants which will harm health. Therefore genjer cultivation has to be conducted in a controlled manner so that the product produced meets the health requirements, besides increasing sales value. Knowledge of appropriate cultivation techniques to increase the production of vegetables that will developed is very necessary.

Genjer has a good enough nutrition as a consumed vegetables. Siemonsma and Piluek (1994) explained that in 100 g of edible parts of genjer contains 1g protein, fat 0.3 g, 0.5 g carbohydrates, 5000 IU vitamin A, vitamins B 10 IU and 38kJ energy value. Other research results indicated that in 100 g of the edible part of genjer contained 90 g of water, energy 35 kcal, protein 1.7 g, fat 0.2 g, carbohydrate 7.7 g, ash 0.4 g, calcium 62 mg, phosphorus 33 mg, iron 2.1 mg, total carotene 3800 µg, thiamine 0.07 mg and vitamin C 54 mg (Mahmud and Zulfianto 2009).

Genjer leaves and flowers have high economic value which is quite high and has been sold well at traditional and modern markets. The edible parts of genjer are young petioles and leaf flowers and stems. Leaf and flowers of genjer are generally stir-fried with mixed with tauco or small pieces of chicken meat or beef. Not only in Indonesia, but also commonly consumed as vegetables in Thailand and sold in the local market; and known as talabhat reusion. In Malaysia, genjer is also commonly consumed (Saupi et al. 2009).

Poh-pohan (*Pilea melastomoides* (Poir.) Bl.)

Poh-pohan (*Pilea melastomoides* (Poir.) Bl.) is a succulent plant. It grows naturally in moist and shady, but well drained conditions such as areas beside gutters, fountains and fish ponds. Farmers not only harvest wild poh-pohan, but also cultivate poh-pohan in upland fields. In humid areas poh-pohan plants are less susceptible to diseases than plants grown in dry areas. It is probable that low light intensity in moist areas (ca 70-80% of full sunshine) is suitable for poh-pohan growth because stalk and petiole color becomes purplish under full sunshine. Ekawati et al. (2010) stated that productivity of poh-pohan growing under up to e.g. 75% of shading is five

times higher than those under full sunshine. Poh-pohan are usually propagated by stem cutting with 2-3 nodes, and rarely propagated by seeds. As Mahyar (1994) stated, poh-pohan can be propagated by seeds, but small seeds like poh-pohan need extra attention at sowing. It takes 3 to 4 weeks for cuttings to attain the size for transplanting, e.g., 10 to 15 cm.

Research done by Desminarti (2010) showed that pohpohan leaves contain ascorbic acid compounds, phenol, α tocopherol, and β carotene which can act as antioxidants. Furthermore, the results of research conducted by Dwiyani (2008) showed that the polar fraction of pohpohan leaves had greater antioxidant activity when compared to the non-polar fraction. Folar fraction contained flavonoids, alkaloids and steroids or triterpenoids.

Batari (2007), Kurniasih (2010) and Apriady (2010) explained that in 100 g of the edible part of pohpohan contain Quersetin 1,75 mg, Kaemferol 0,25 mg, Luteolin 0.33 mg, Antosianin 0,75 mg, Klogenat Acid 17,47 mg, Kafeat Acif 1,11 mg, Ferulat Acid 0,17 mg.

Leunca (*Solanum americanum* Miller)

Leunca (*Solanum americanum* Miller) is a perennial crop which probably originated in South America (Siemonsma and Jansen 1994). It is cultivated together with cash crops on farms and home gardens or grows wild as a weed. Plants are propagated by seed or stem cutting. Seeds were collected from mature, dark purple fruits. Seedlings are transplanted 3 weeks after sowing, while 15-20 cm stems are planted directly into soil for stem cutting. Plants were planted in a square pattern. Inflorescences are harvested when fruits become dark green to tinny light purple in color. In intensive cultivation, which is carried out by some farmers, nitrogen fertilizer is applied at a rate of 2-3 g per plant to maintain high productivity. According Putriantari and Santosa (2014) fruit production of leunca increases by increasing level of N application, application at rate of 180 kg N ha⁻¹ obtains more than 18 ton fruit ha⁻¹ during growing season equal to 2000 kg ha⁻¹ per harvest. Therefore, low productivity of leunca of farmers in this study could be ascertained from low N application.

The edible parts of leunca plants are young fruits and leaves. Every 100 grams of fresh leunca fruits contains 90 g of water, 1.9 g of protein, 0.1 g of fat, 7.4 g of carbohydrate, 274 mg of Ca, 4.0 g of Fe, 0.5 g of carotene, 0.1 mg of vitamin B1, and 17 mg of vitamin C (Siemonsma and Jensen 1994) Commonly, leunca is used as vegetables from its young leaves and the fruits that can be cooked as a stew and stir-fry. Based on Pratiwi's research (2011), 56.4% of 90 respondents said they liked to consume leunca. However, most of the leunca fruit is harvested from areas that lack maintenance.

Gogoi and Islam (2012) research showed that leunca fruits contain secondary metabolites, namely alkaloids, saponins, tannins, and flavonoids. In addition, there are reducing sugars, glycosides, gums, and steroids in leunca fruits from phytochemical screening results (Karmakar et al. 2010). These secondary metabolites are thought to be efficacious as a drug. Types of alkaloids in *S. nigrum* are solamargin, solasonin, and solanine (Jain et al. 2011). The

alkaloids contained in the leaves are solasonin and solamargin, while in the fruit there are solanine, solamargin, solasonin, α and β solanigrin, and solasodine, and solanine in the seeds of Leunca plants (Karmakar et al. 2010).

In conclusions, the role of utilizing minor vegetables to help to overcome nutritional problems in Indonesia, especially for pre-family prosperous, is reliable because minor vegetables have been adapted to the local environment by means of easy cultivation and low cost. Minor vegetables are still require further study of their economic values, potential nutritional content as well as its for development.

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