

## Study of Development Potential Chrysanthemum in Buleleng Regency

I Gusti Made Arjana, Yohanes Parlindungan Situmeang and I Nengah Suaria

*Faculty of Agriculture, Warmadewa University, Denpasar, Bali, Indonesia*

*E-mail: igm.arjana@gmail.com; ypsitumeang63@gmail.com*

---

**Abstract**— The purpose of this study was to determine the potential of agro-climate, technology of cultivation, harvest and post-harvest chrysanthemums. This study uses survey method, through the collection of primary data and secondary data. This research is located in the village of Pancasari, District Sukasada, Buleleng Bali Province. Descriptive survey conducted on 40 respondents chrysanthemum growers using the component identification of determinants of commodity production chrysanthemum include: site selection, infrastructure, crop production processes and post-harvest handling. The survey results showed that 100% of the farmers have chosen a suitable location with agro-climatic conditions required by the chrysanthemum plant, and 86.09% of the farmers have been using the means needed to support the process of crop production. In the process of production of 78% in accordance with the operational procedures. At the stage of harvest and post-harvest handling 80% have been implemented by farmers and some still use conventional methods of handling. Thus Pancasari village has a potential location for the cultivation of chrysanthemum as a mainstay commodity.

**Keywords**— Chrysanthemum; Development Potential; Buleleng Bali.

---

### I. INTRODUCTION

Chrysanthemum (*Dendranthema grandiflora*, Tzvelev Syn) or known as the Chrysanthemum flower, is a commodity that has economic value that is high enough so that the potential to be developed commercially as a basic component in the agribusiness good as cut flowers, potted plants, and medicinal plants [8]. The cultivation of chrysanthemums which initially concentrated in Java, has now spread to Bali, this means that the development of ornamental plants in Bali in the future is quite good because it is supported by the natural resources. This reflects that in the interest of the growers of ornamental plants and on the other hand increases the demand for ornamental plants also increased. The increase is due Bali as a tourism and socio-cultural conditions of the people of Bali who wear flowers as a complementary means of religious ceremonies in addition to other purposes.

Production of chrysanthemum flower in Bali have not been able to meet the needs of the market due to low productivity and farm areas are still cultivated by farmers only. The increase in production should be increased either through extension or intensification. Planting chrysanthemums in Bali so far only concentrated in Bedugul area that needs to be developed in other areas of potential. Increased production through intensification frequently encountered problems such as the provision of planting

materials (cuttings), especially farmers who are outside the island of Java, spacing arrangement, arrangement of soil moisture by mulching, the determination of the optimum dose of organic and inorganic fertilizers, post-harvest and the management of production systems.

Based on the above, it is necessary to research on potential areas of investment and technology chrysanthemum plant cuttings in a comprehensive manner, which will be used by farmers to support the production and quality of chrysanthemum flowers that also will be able to increase the income of farmers.

The purpose of this study is to obtain the chrysanthemum plant with the potential development of appropriate farming technologies to increase productivity and income of farmers as well as the quality of chrysanthemum plants. Cultivation technology is done by applying site-specific farming technology and other components in an integrated aquaculture and maintain soil fertility, environmental sustainability and sustainable production systems.

### II. RESEARCH METHODS

The study was conducted in the village of Pancasari (Figure 1), district Sukasada, Buleleng regency of Bali province, with a height of 1,247 meters above sea level and an average temperature of 17°C to 20°C. This study begins in January 2014 and ended in August 2014.

This study is to assess the potential of agro-climate, crop cultivation technologies, post harvest farming chrysanthemum, using survey methods (collecting primary data and secondary data) for testing recommendation cutting plant material application technology. Survey method of data collection is done by direct interviews with farmers chrysanthemum with questionnaires to the respondents as many as 40 people that lists the components identified determinant factor chrysanthemum crops [3]. Components include site selection, infrastructure, production, harvest and post-harvest, and other components of chrysanthemum production constraints and market facing local farmers.



Fig. 1 Map of Study Sites

### III. RESULTS AND DISCUSSION

Of the 148 villages in Buleleng, Pancasari is a village located on the southern most district of Buleleng. Location of village area Pancasari at position 8 ° south latitude and 115 ° East Longitude with an area of 12.80 km<sup>2</sup>. Based on population registrasi Pancasari number of villagers as much as 4,783 people (2,323 men, 2,460 women) with 1,003 heads of families with livelihood mostly as farmers fields as many as 2,588 inhabitants and agricultural land with an area of 365.73 ha.

TABLE I  
TYPE OF HORTICULTURAL COMMODITIES AND PLANTING AREA PER YEAR IN THE VILLAGE PANCASARI

No	Commodities	Planting Area (Ha)
1	Cabbage	74
2	Carrot	100
3	Potato	36
4	Large Chili	9
5	Tomato	30
6	Strawberry	58
7	Paprika	3
8	Chrysanthemum	3
9	Etc	59
Total		382

Pancasari village is a plateau region located at an altitude of 1,247 m above sea level surrounded by hills and mountains. Conditions were cold and cool nature of this village has potential as a producer of horticultural products such as fruits, vegetables and flowers, this is because the farmers are creative and innovative with environmental conditions suitable for the growth and development of horticulture. The village is also famous as a producer of strawberries, peppers, lettuce, potato and tomato plants other potential, which was developed in house protected so that production does not depend on the season. Type horticulture and rural planting area per year Pancasari 2012 are presented in Table 1 [6].

From the table above, chrysanthemum and bell pepper plants occupy the smallest area cultivated in this village per year. Looking at the climate conditions and market opportunities chrysanthemum plants have significant potential to be developed. The results of the survey conducted components include a review of potential agro-climate, cultivation, harvest and post-harvest are presented in Table 2, 3, 4, 5, and 6.

#### A. Site Selection

Each type of plants need different growing conditions so that plants can grow optimally, site selection is less suitable for the cultivation of chrysanthemums will have an impact on the growth and development of plants that are less good. Chrysanthemum cultivation will be successful if 95% of environmental conditions meet the criteria for the cultivation of chrysanthemums as altitude of about 600-1200 m above sea level, sandy clay soil texture, good drainage, soil pH ranged from 5.5 to 6.7, temperature day and night average days 22°-28°C and 15°-20°C, humidity 70-85% with a slope of less than 10%. From Table 2 and see the above requirements then Pancasari village has an ideal location requirements (100%) for the cultivation of chrysanthemums as a mainstay commodity other than the type of plant that has been cultivated by farmers. This situation illustrates the development of chrysanthemum cultivation can be done in this village because it is supported by sufficient potency, which is supported by the land and climate suitability and supported by a mastery of technology, the availability of extension workers and farmer cooperation between groups [7].

TABLE II  
DATA FROM THE SURVEY COMPONENT OF SITE SELECTION

No	Site Selection	Component	
		Weight	Weight Respondents
1	Environmental conditions	10	10
	Soil pH	5	5
	Soil conditions	10	10
	Elevation	10	10
	Temperature day and night	10	10
	Humidity	10	10
	The slope of the land	10	10
	Around there planting chrysanthemums	5	5
	Total	70	70

#### B. Infrastructure

Preparation of protected house aims to get micro-climatic conditions and protect crops from pest attack and environmental stresses directly in order to obtain an optimal environment in which to grow. In the preparation of the protected home that need attention are: the design, shape, material protected home, height, roof and walls of the house protected. From Table 3 can be seen that 94% of respondents farmers have to follow procedure. This is due to the preparation of the protected houses adapted to local resources and willingness to fund local farmers, most of the material protected using a combination of wood, bamboo and concrete and the roof is used using ultra violet plastic, although some farmers are using the aluminum construction.

TABLE III  
DATA FROM THE SURVEY COMPONENT OF INFRASTRUCTURE

No	Infrastructure	Component	
		Weight	Weight Respondents
1	Preparation Home Protected	80	75
	Design house hedge	10	10
	Protected home form	10	10
	Materials used	15	15
	Height of the protected home	15	15
	Roofs protected	15	10
	The wall is protected	15	15
2	Irrigation Facilities	30	30
	Source of water	10	10
	Water channel	10	10
	Area network	10	10
3	Means of lighting installations	35	35
	Tools and materials	5	5
	Installation of switches and sockets	5	5
	Area network	10	10
	The distance between the lamp	10	10
	Use timers	5	5
4	The support rod means Chrysanthemum	25	25
	Tools and materials	5	5
	Installation of cantilever	10	10
	The distance between holes	10	10
5	Means of measurement EC, pH, and soil moisture	10	0
6	Material and Equipment Use of plant growth regulators	10	0
7	Other Production Facility	20	20
	Grading and packing house	10	10
	Type and post-harvest equipment	10	10
8	Other Production Facility	20	13
	Type and number of devices	5	5
	Storage devices	5	5
	The appliance warehouse	5	3
	Inventaris Notebook	5	0
	Total	230	198

Irrigation (water sources, waterways, extensive tissue), means of lighting installation (materials and equipment, switches and sockets, extensive network, the distance between the lamp and timer), a means of supporting plant stems (equipment and materials, installation cantilever, the distance between hole) and post-harvest facilities (grading and packing house, kind and post-harvest equipment).

Average farmer almost 100% of the 95% procedure otherwise qualified to complete the facility in chrysanthemum cultivation, as a means of lighting installation is one of the special tools that must be met in getting the chrysanthemum plant. While other production facilities such as; a tool shed, storage tool type and amount of equipment and inventory notebook is a new procedure to qualify 65%, this is because farmers do not keep records of the owned inventory and warehouse storage place is available but not in accordance with the procedure. While the means of measurement tools EC, pH, moisture, material and equipment the use of growth regulators in no way owned by farmers, it is associated with the ability of farmers to buy such a device owned by farmers and farmers' lack of knowledge about the function and use of these facilities.

### C. Production Process

Chrysanthemum plants grown in monoculture on the bed in the hedge that has been prepared, therefore, the

production process should be carefully prepared in order to produce excellent quality in accordance with the defined quality standards. Because chrysanthemum production process is different from other types of ornamental plants.

The stages of the production process in the cultivation of chrysanthemum plants (Table 4) include: tillage, sterilization area, a raised bed, setting the supporting plant, the operation of the lamp, measurement (EC, pH and soil moisture), calcification, selecting quality seeds, planting, weeding, fertilizing, controlling plant pests, weeding, provision of plant growth regulators, *pemontesan* flower buds, *perompesan* old leaves and environmental sanitation.

Chrysanthemum cultivation of land by farmers in Pancasari have followed the requirements of the production system in accordance with the procedure include: tillage, leveling and dumping the rest of the plant. Chrysanthemum is a plant that requires the planting medium with the requirements of a particular condition is maintained during the production process [2].

Sterilization of land made to control the disease from the group of fungi and bacteria, but in this stage farmers in Pancasari not sterilize the land by reason of the condition of the land is still in good condition for the growth of newly planted plants as chrysanthemum, in addition to it as early as possible to reduce the impact of soil contamination to materials chemistry as well as necessary skills for farmers in the implementation stage of the production process. In addition to soil sterilization, production systems are not made by farmers Pancasari is the measurement of EC, pH, soil moisture, giving a growth regulator. This is due in addition to those tools are not affordable by the farmers, the work instructions of the device has not been understood by growers as the method of measurement and recording data.

The stages of the production process such as: making beds (direction, shape, width and spacing between beds), the selection of quality seeds (varieties, seed origin, resistance on plant pests and seed production), planting (method, spacing, and watering before planting), watering (method, time, frequency and adequacy of watering), fertilization (type, dose, method and time), pest control (type, dose, manner, and time), weeding (method, frequency and equipment), and environmental sanitation (methods, equipment and utilization of waste). Stages of the process over 92% of 95% following the suggestion categorized qualify, this is due to the selection of varieties of chrysanthemum growers in Pancasari still using imported seed, beyond the recommended procedure for the use of seed introduction and breeding in the country.

In the cultivation of chrysanthemums are a special production process that require attention compared to the other cut flower crops, such as: disposal of the apical growing point (pinching), *pemontesan* flower buds (disbunding), *perompesan* old leaves (senescent), chrysanthemum stem cantilever arrangement, operation of light artificial. Stages of the production process has been carried out by farmers in Pancasari chrysanthemum as required. Disposal of the apical growing point (pinching) serves to stimulate the growth of axillary shoots branching done on planting crops for the production of chrysanthemum flower spray type [2], while the flower buds *pemontesan* (disbunding) performed at the first flower that appears with

the aim of provide uniform growth and development that arise from axillary buds. Chrysanthemum stems aims to help the plants grow upright plant with provision of enforcement nets, nets gradually increased along with the growth of plants. Disposal of old leaves is done to set good air circulation along with the growth of more mature plants.

TABLE IV  
DATA FROM THE SURVEY COMPONENT OF PRODUCTION PROCESS

No	Production Process	Component	
		Weight	Weight Respondents
1	Tillage	25	25
	The depth of tillage	10	10
	Alignment of land	5	5
	Disposal of crop residues	10	10
2	Sterilization land	25	0
	How sterilization	10	0
	Materials used	5	0
	Time sterilization	5	0
	Effectiveness sterilization	5	0
3	Making Beds	25	25
	Direction and the form of beds	5	5
	Width of beds	10	10
	The distance between beds	10	10
4	Cantilever arrangement chrysanthemum stems	20	20
5	Operation lamp	45	45
6	Measurement of EC, pH, and soil moisture	15	0
	Methods of measurement	5	0
	Recording of data	5	0
	Health and the tool	5	0
7.	Liming/calcification	20	5
	Dose / amount requirements	10	0
	Calcification	5	5
	Long incubation	5	0
8	Selection of Seed Quality	80	63
	Seed varieties	20	20
	Origin of seed	20	3
	Resistance on the pest	20	20
	The amount of net production	20	20
9	Planting	25	25
	Watering before planting	10	10
	Ways planting	5	5
	Spacing	10	10
10	Watering the plants	25	23
	Method of watering	5	3
	Adequacy watering	10	10
	Time watering	5	5
	Frequency of watering	5	5
11	Fertilization	40	31
	Type of fertilizer	5	2
	Fertilization basic inorganic	5	3
	Dose	5	3
	Ways	5	3
	Time	5	5
	Dose manure	5	5
	Ways manure application	5	5
	Timing of manure	5	5
Total	500	390	

Operation of artificial light because chrysanthemum is a short day plant (short day plants) which will naturally vegetative growth on a long day (long day plant) in the summer, and will experience growth in the short-generative in the fall with the later flowering buds forming [5]. Chrysanthemum called facultative short day plant (facultative short-day plant) this would imply that characteristics induced entry into generative phase and

flowering when day length (number of hours the light) is shorter than Daylength Critical (CDL), if the length of the plant received chrysanthemum in the juvenile period is longer than his CDL will retain the chrysanthemum plant vegetative phase [1]. In the chrysanthemum plant, the limit is 13 hours of light. This means that if a long exposure is less than 13 hours will be flowering plants [5]. On the equator, the length of day and night almost equal length, which is about 12 hours. Naturally means chrysanthemum plants will be flowering at all times, even if the plant is still shaped seeds. To obtain a standard stem length of cut flower chrysanthemum in accordance with the market demand that is at least 60 cm and a maximum of 80 cm. So chrysanthemum plants require additional lighting for 4 hours per day with the optimum light intensity between 70-100 lux. In general, additional light is given continuously or cycle for 3 to 6 weeks after planting; depending on cultivation techniques and kultivar [4].

#### D. Harvest and Post Harvest Handling

The timing of harvest, harvesting, sorting and grading was performed according to the terms in the system recommended procedure chrysanthemum production by farmers in the village Pancasari (Table 5). Harvest is a critical point in the business of cut flowers, including chrysanthemum, harvesting should be done at appropriate harvest index provisions, as appropriate harvest flower quality can not be improved unless the maximum is only maintained [2]. Sorting and grading aims to separate the flowers are damaged or defective due to pest attack and physical damage to healthy flowers. The best quality of chrysanthemum flowers as cut flowers produced during the production process must be maintained during harvest and post harvest.

Soaking flower stalk, flower storage, packaging and packing requirements not meet recommended procedure, entirely done by the farmers in the village Pancasari chrysanthemum, farmers in the process of soaking the flower stalk does not use preservatives either preservative composition, dosage and concentration as required, it this does not take full account of the distribution channels can be reached in a short time so that the condition of interest to the consumer is still in a good quality and to reduce manufacturing costs.

#### E. Other components

Other components are used as indicators concerning: the obstacles in the cultivation of chrysanthemum, the product absorbed by the market, consumers preferred varieties, production absorbed by the market, and the resulting production. Component above 75% can only qualify the recommended procedure, because of the constraints cultivation attack plant pests (leaf rust) and not continuous supply of seeds from seed producers so that continuity can not be run in accordance planting calendar will affect consumer confidence. The resulting production to market needs is still low when compared with the absorption of the market, since the average production capabilities of farmers between 10,000-50,000 chrysanthemum stems per season.

TABLE V  
DATA FROM THE SURVEY COMPONENT OF HARVEST AND  
POST-HARVEST HANDLING

No	Harvest and Post-Harvest Handling	Component	
		Weight	Weight Respondents
1	The timing of harvest	40	40
	Criterion for harvest	20	20
	Mechanical harvester	20	20
2	Harvesting	30	30
	Tool condition	5	5
	Cutting the flower stalk	5	5
	Storage	10	10
	Immersion	10	10
3	Sorting and Grading	40	40
	The process of sorting and grading	15	15
	Sorting and grading	15	15
	Packaging and labeling	10	10
4	Soaking flower stalk	30	15
	Preservatives	5	0
	The composition of the active ingredients preservatives	5	0
	Concentration and dose	5	0
	Place used to soak	5	5
	Length of flower stalks are soaked	10	10
5	Storage Flowers	30	15
	Storage	10	5
	Temperature / humidity room	5	0
	Grade grouping in storage	10	10
	Immersion flower stalk	5	0
6	Packaging and Packing	30	20
	The packaging	10	5
	Forms and packaging materials	5	5
	Identification of the company	5	0
	The size and shape of the packing	10	10
	Total	200	160

TABLE VI  
DATA FROM THE SURVEY COMPONENT OF OTHER COMPONENTS

No	Other Components	Component	
		Weight	Weight Respondents
1	Constraints cultivation of chrysanthemums	25	5
	Product absorbed by the market	25	25
	Varieties preferred by consumers	10	10
	Prospects of cultivation of chrysanthemum	20	20
	Production absorbed by the market	10	10
	Production produced	10	5
	Total	100	75

#### IV. CONCLUSIONS

Potential agroclimate Pancasari villages, districts Sukasada, Buleleng regency has the potential locations for the cultivation of chrysanthemum as a mainstay commodity. Infrastructure chrysanthemum cultivation by farmers in the village Pancasari have met the criteria in the procedure of the production system. Other infrastructure tailored to the knowledge, capabilities and functions. The production process is carried out by farmers in the village Pancasari has been conducted in accordance with the recommended procedure, but there are several processes performed by the local environmental conditions, ability and habits of farmers.

Implementation of harvest and post-harvest handling by farmers in the village of chrysanthemum Pancasari been applied according to the procedure, while the immersion activities flower, flower storage, packaging and packing not meet the recommended requirements. Constraints faced by farmers in the village Pancasari chrysanthemum is the availability of seeds that are not continuous, attack plant pests, and production capacity is still low. Further studies need to be done on the survey results, and the motivating factors that can be used as a reference in order to generate recommendations technology implementation cuttings. Chrysanthemum cultivation technology is specific agroecological, varieties and farmers markets chrysanthemum flower producers are expected to adapt to existing conditions, and build the field of empirical experience with the application of existing technology.

#### ACKNOWLEDGMENT

Much obliged for DP<sub>2</sub>M DIKTI which have funded Decentralization Research Competitive Grant in 2014. Thanks also goes to all those who have helped this research.

#### REFERENCES

- [1] Balai Penelitian Tanaman Hias, 2006. Teknologi Produksi Krisan. Pusat Penelitian dan Pengembangan Hortikultura Badan Penelitian dan Pengembangan Pertanian.
- [2] Budiarto, K., Yoyo Sulyo, Ruud Maaswinkel dan Sri Wuryaningsing, 2006. Budidaya Krisan Bunga Potong, Prosedur Sistem Produksi. Pusat Penelitian dan Pengembangan Hortikultura, Applied Plant Research (PPO), the Netherlands, Plant Research International (PRI)
- [3] Direktorat Budidaya Tanaman Hias. 2007. Standar Operasional Produser Budidaya Krisan Potong. Direktorat Jenderal Hortikultura. Departemen Pertanian, Jakarta.
- [4] Fides, 1990. *Fides Mum Manual* (Delier : Fides Holland BV)
- [5] Kofranek, A.M. 1980. Cut Crysanthemum, In RA Larson (Ed.). Introduction to Floriculture. Academic Press, Inc. New York.
- [6] Monografi Desa Pancasari Kecamatan Sukasada, Kabupaten Buleleng 2012
- [7] Rudianta, I Nyoman dan I GD. Pasek Mangku, 2013. Alternatif Strategi Pengembangan Agribisnis Bunga Krisan. Gema Agro Fakultas Pertanian Universitas Warmadewa Denpasar. Jurnal Pertanian Vol. XIV. No. 33. September 2013.
- [8] Rukmana, HR. 1997. Krisan. Penerbit Kanisius. Yogyakarta