Culture and Management Practices of Watermelon Farmers in Western Pangasinan, Philippines

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Abstract- *The popularity of watermelon has become widespread in all tropical and subtropical regions of the world and is one of the most popularly grown fruit vegetables in the Philippines during summer. Watermelon production is becoming one of the most lucrative industries along Agriculture although watermelon is considered minor fruit in the Philippines. With the significance of the industry in providing a source of livelihood to the poor and average-income families, the study assessed the present status of watermelon production in different farming areas as a basis for technology and policy development. Descriptive-survey research design was employed with 42 watermelon farmers from Western Pangasinan as respondents, selected using multi-stage sampling technique. Results of the study have shown that watermelon farmers are mostly males, young, middle-aged, married and belong to a household with average size (4 – 5 members). The farmers are basic education graduates and poor who rely on their experiences in watermelon production and do not embrace innovative practices. With the non-existence of farmers' organization, the farmers engaged in watermelon production do not receive adequate government support. Watermelon production is highly profitable, however, as caused by various constraints such as lack of capital and irrigation, the farmers do not engage in large scale production.*

Keywords: *Socio-economic profile, culture and management practices, watermelon production*

INTRODUCTION

History shows that all nations who have become progressive and highly industrial and technological have evolved from being an agricultural nation. The importance of agriculture as a propeller of development is no longer a matter of question. This is the very reason why U.S., China, and other progressive countries continuously improve their agriculture sector through the conduct of researches.

While the Philippines has a fertile soil and appropriate climate, rich crop diversity, and available technology, minor tropical fruit industry does not flourish because of the lack of growers. Most tropical fruits are grown in backyards and small areas. There is also limited access to good planting material and R&D activities, poor adoption of technology, lack of production standards, and incidence of pests and diseases (itfnet.org, 2012). Agriculture, fishery, and forestry directly account for just 20% of the economy's aggregate domestic output (GDP) [1].

Watermelon production is becoming one of the most lucrative industries along Agriculture. More farmers are engaging in the production. In the year 2012, China ranks first among the major producers of watermelon worldwide followed by Islamic Republic of Iran, Turkey, Egypt, and India [2]. In the Philippines, watermelon is considered a minor fruit. Production is usually from February to May. However, off-season production usually starts from October to January. Records from the Bureau of Agriculture Statistics showed that in the year 2010, a total of 6,700 hectares were planted with watermelon or a total volume of 110,238 metric tons. The major producers of watermelon in the Philippines are Bulacan, Pampanga, and Pangasinan. Pangasinan has a total production of 18,331.05 in the year 2012 and 18,040.5 tons in 2013[3].

Adeoye et al. (2011) in their study found that 94.9% of watermelon farmers were male and 96.6% of them were married. Watermelon was predominantly grown as a sole crop by 52.8% while 47.2% of farmers engaged in intercropping. Budgetary analysis revealed that intercropping watermelon with cassava has a higher gross margin (₦258, 367.02/ha) than planting watermelon (₦232, 918.06/ha) alone. The benefit/ cost ratio (BCR) of sole watermelon (2.35:1) was greater than watermelon cassava intercropping system (2.13:1). Yield level was positive and significantly

influenced by labor input. The level of education was significant and found to contribute positively to technical efficiency while farming experience was found to reduce the same. Inadequate credit facilities (78%), pest and disease (76.3%), inadequate fertilizer (69.5%) and high transportation cost ((54.2%) were the prominent constraints to watermelon production in the study area.

Watermelon grows best when the monthly average temperature is about 21ºC to 29ºC. Regular planting is in October to January while off- season production is being done early August. A well- drained, fairly fertile and sandy loam soil is ideal for watermelon production, however, with proper cultural management; it can be successfully grown in clay soil. The field can be prepared thoroughly by plowing and harrowing and removing the different plant debris. It should also be pulverized and leveled; furrows are made 2 meters apart. However, it is a common practice in the Philippines that holes are dug one meter apart. Seeds can be pre-germinated before sowing by soaking it in water for an overnight period. After germination, 2-3 seeds will be drilled per hill at a distance of 1.5x 2,0 meter apart. Ten to fifteen days after emergence, thin to one plant per hill, a hectare of land will need 3-4 kilograms of seeds [5].

In applying fertilizer, soil analysis is recommended, but in general, for organic fertilizer, a hectare should need about 10-15 tons. Fertilizer is usually applied side dress with 10-20 grams per hill of 14-14-14 two weeks until the onset of a female flower. At fruit setting, 10 grams of urea (46-0-0) and muriate of potash (0-0-60) at 1:1 ratio 2-3 times every two weeks should be applied. The field should be irrigated whenever necessary by either using furrow irrigation or by manual watering. Frequent high irrigation, 10-15 times, is recommended at planting time, vegetative, flowering and fruiting development stage. Do not allow the fruits to get wet while irrigating. Two weeks before maturity, irrigation should be stopped. Shallow cultivation by off baring, 15 days after planting followed by hilling-up at 30 days after planting and hand weeding after that until the crop has attained sufficient size to cover the soil which in turn will suppress the growth of weeds is recommended [5].

Vines are rearranged or trained the along the rows 25 days after planting to facilitate watering and weeding, but main vines should not be touched anymore. Removal of misshapen fruits, thinning of two fruits per vine of varieties which produced large size fruits and 4-6 in the case of small-fruited varieties are suggested and done when the biggest fruit is 10 cm long and 10 cm in diameter [5].

Thrips, aphids, cucurbit beetle, melon fruit fly, spider mites, cutworm are the most common insects that attack watermelon. To control insects, an insecticide should be sprayed at manufacturer recommendation. Downy mildew, powdery mildew, mosaic, and anthracnose are the common diseases that affect watermelon. It is advisable to use appropriate chemicals in controlling these diseases by following the manufacturer recommendation [5].Watermelon do not ripen further after picking; hence the fruits should be mature enough when harvested. It takes a watermelon to mature from 35 to 45 days after pollination.

Given the significance of the industry in providing a source of livelihood to the poor and average income family, it is essential to assess the present status of watermelon production in different farming areas so that development/expansion could be made to enhance watermelon production in the country. The project assessed the (1) Socio-Agronomic and demographic profile of the farmers engaged in watermelon production; (2) their cultural and management practices; (3) the benefits derived; and (4) the problems encountered in producing watermelon.

METHODS

The study made use of the descriptive survey research design. The design was used since the focus of the study was to assess the watermelon industry in Pangasinan as a basis for technology and policy development. The study was conducted in the western part of the Province of Pangasinan, Philippines covering the municipalities of Anda, and Bani and the city of Alaminos which are the primary producers of watermelon in the province.

Bani, Pangasinan is a well-known watermelon producer in the Philippines. It is noted for producing the sweetest, the reddest and the juiciest watermelon in the province and in the country. Before 1986, watermelon production was unheard of in Bani. Farmers School on the Air, a radio program sponsored by the Bureau of Soils assisted by Bayer Philippines started trial plantings. It was a hit and miss affair, using the information given by the radio program. With this, the peculiarities of the people were in play, shying away from the uncertain. Now, a decade after, the farmers of lowland Bani derive no less than P20 Million in net income from watermelon production. To top it all, Bani farmers have mastered the technology and which has earned for Bani the reputation as the home of the sweetest, the juiciest and reddest

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watermelon in the country [5]. Anda is now considered as one of the major producers of watermelon in Pangasinan. A total of 40 hectares is being planted with watermelon. With an estimate of 40 metric ton per hectare, Anda has an annual production of 1,600 metric tons [6]. Alaminos is the home to the Hundred Islands National Park, the very first national park in the Philippines. It is also the heart of Western Pangasinan, its center of commerce, finance, education, industry, and services. Alaminos City is now one of the largest producers of watermelon in the province [7].

The respondents were selected using a multistage sampling technique. Based on the *apriori* information, three local Government areas with the highest density of watermelon farmers were selected using purposive sampling technique. The second stage was the random selection of producers from each local government areas based on the total number of watermelon farmers. A total number of 42 farmers were selected for an interview.

Data were collected using face-to-face interview with the aid of a structured questionnaire. The socio-economic profile of the farmers (age, education, monthly family income, income derived from watermelon production, household size, employment, gender and marital status) were determined. Likewise, the agriculture profile (primary source of income, number of years in watermelon production, number of training/seminars attended related to watermelon production, membership to organization, farm size planted with watermelon, number of holes cultivated, and land ownership.) was assessed. The culture and management practices (land preparation, sowing, fertilization, irrigation, pest and disease management, harvesting and technology utilization), the problems encountered, and the benefits derived in watermelon production were also determined.

Data were analyzed using descriptive statistical techniques specifically frequency counts and percentages.

RESULTS

Socio-economic and Agronomic Profile of the Farmer-Respondents

Results of the analysis showed that (50%) were aged 51 and above while the remaining (50%) were 50 years old and below. Most (97.6%) of the respondents were males, married (95.2%) wherein (76.19%) have a household size ranging from 4 – 6 while the same percentages of (11.10%) have household sizes ranging from 1 – 3 and 7 – 9. Only (11.90%) of the respondents have finished tertiary education. However, 28.57% have taken vocational courses, and the rest (59.56%) were primary and secondary education graduates. The majority (85.71%) has a monthly income that is below 10,000.00 with (4.76%) earning more than 20,000.00.

Analysis of the data showed that (78.6%) of the respondents rely primarily on farming as their source of income. Of the (21%) whose primary source of income is not farming, (16.67%) were engaged in fishing which is one of the primary sources of income in the localities due to their topographies.

Regarding the number of years the respondents are engaged in watermelon production, (66.67%) were into watermelon production for more than ten years. The rest were involved in the production for less than ten years. Most (95.24%) of the respondents have not attended any training or seminar in watermelon production. The majority (92.86%) of the respondents were not members of any organization. With regards to farm size, (52.38%) of the respondents are planting watermelon in less than 1 hectare while 21.43% were planting watermelon in an area of 1 hectare. Only (7.13%) of the respondents were planting watermelon in an area of more than 3 hectares.

Results revealed that (38.1%) of the farmers have cultivated less than 1000 holes while (42.9%) have cultivated 1000 to 5000 holes. Regarding land ownership, (21.4%) of the respondents owned the land they are farming watermelon while (57.1%) leased the lands where they planted watermelon.

The variety commonly used by the respondents is sugar mommy where (71.43%) of the respondents were using this. Further, (4.76%) of the respondents are planting different varieties where the respondents plant the Diana variety in combination with sugar mommy. The reason for using the varieties is mainly because these are the varieties that the buyers and consumers prefer. The sugar mommy variety produces an average of 7 to 8 kg fruit.

With regards to land preparation, (95.24%) of the respondents planted watermelon by digging holes in the field 1 m apart with an approximate diameter of 20 m and depth of 10 cm. Watermelon was planted through direct seeding by (88.10%) of the respondents, usually three seeds per hole. In applying fertilizer, (97.62%) of the respondents applied fertilizer by dissolving fertilizer in water in increasing concentration every other day 15 days after planting. During fruit setting, urea is used by the farmers. During the interview, it was revealed that the respondents apply fertilizer by estimation and not following the manufacturer's recommended rate (Table 1).

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Table 1. Cultural Management Practices of the Farmer- Respondents

Practice	f	%
A. Land Preparation		
1. Fields are prepared thoroughly by plowing and harrowing and furrows are made 2 meters apart.	2	4.76
2. Holes are dug on the field 1 meter apart. Each hole has an approximate diameter of 20 cm and 10 cm depth.	40	95.24
B. Method of Seed Planting		
1. Direct seeding	37	88.10
2. Transplanting	5	11.90
C. Fertilizer Application		
1. Fertilizer is applied side dressed only once during planting.	1	2.38
2. Fertilizer is dissolved in water and applied by every other day 15 days after planting in increasing level. During fruit setting, urea is being used.	41	97.62
D. Irrigation		
1. The field is irrigated whenever necessary by either using furrow irrigation or by manual watering. Ten days prior to maturity, irrigation is stopped.	1	2.38
2. The field is irrigated by manual watering everyday at increasing level. Ten days prior to maturity, irrigation is stopped.	41	97.62

Table 2. Cultural Management Practices of the Respondents

Practice	f	%
E. Weeding and Cultivation		
1. Weeding is done only in the holes.	40	95.24
2. No weeding is done.	2	4.76
F. Fruit Thinning		
No thinning of fruit is being done.	0	0.00
Only misshapen fruits are removed.	3	7.14
Thinning to two fruits per vine.	6	14.29
Thinning to 1 fruit per vine.	33	78.57
G. Pest Management		
Spray insecticide at manufacturer recommendation.	17	40.5
Spray insecticide by estimation.	25	59.5
H. Disease Management		
Use appropriate chemicals in controlling diseases by following the manufacturer recommendation.	6	14.3
Use any kind of chemical based on old practice and by estimation.	36	85.7
I. Harvesting		
Harvesting is determined by tapping fruits.	0	0.00
Harvesting is determined by number of days.	42	100.00
J. Technology used		
Purely inorganic	9	21.4
Purely organic	0	0
Mixed (organic and inorganic)	33	78.6

The majority (97.62%) of the respondents irrigated or watered their plants every day. The volume of water increases to 1 liter during the fruiting stage. Irrigation was stopped ten days before maturity. Weeding was done only in the holes by (95.24%) of the respondents while (4.76%) do not perform weeding. Those who do not weed are using mulch. Results showed that (78.57%) of the respondents maintained only one fruit per vine. Concerning pest management, (59.5%) of the respondents applied insecticide by estimation. Likewise, (85.7%) of the respondents used any chemical based on old practices. Harvest time was determined by counting the number of days the plants were planted. Results showed that (78.6%) of the respondents were using both organic and inorganic fertilizers. However, 21.4% were using purely inorganic fertilizers (Table 2).

The results of the study revealed that almost all of the watermelon farmers (97.62%) sell their products to buyers at wholesale. Farm-gate price ranges from PhP6.00 – 8.00 per kilo. Only one farmer distributes his produced to retailers in various areas within and outside Pangasinan. The distribution area is as far as Batangas, Philippines. When asked how the farmer was able to do this, the farmer revealed that he had studied different marketing aspects to increase profitability. He started selling his produced along national roads. When he found the strategy effective, he trained other people to become his retailers. With this, he has increased the distribution price up to PhP10.00 – 12.00 per kilo. When asked if the farmers are interested in selling their produce to institutional buyers, the farmers were not interested because it takes time for institutional buyers to pay the produced delivered to them.

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The farmers have identified seasonality, the volume of production, and incidence of pest and diseases as the primary factors that affect profitability in watermelon production. In response to this, some of the farmers start planting watermelon in August for them to be able to bargain higher price during November and December. Production is lessened during the hot months to prevent loses due to pest infestation such as thrips.

Most of the farmers engaged in watermelon production in single cropping due to irrigation problem in the locality. Those who do double cropping usually change their production site by renting a piece of land where there is available water supply.

Table 3. Problems Encountered in Watermelon Production

Problem	f	%
1. Lack of capital to by farm inputs.	29	69.05
2. High price of farm inputs.	31	73.81
3. Lack of agricultural equipment.	27	64.29
4. Presence of pest and diseases and occurrence of natural calamities such as typhoons.	37	88.10
5. Low price of watermelon in the market.	30	71.43
6. Lack of government support.	30	71.43
7. Lack of irrigation	42	100.00

The number 1 problem encountered by the respondents in growing watermelon is lack of irrigation system. All of the respondents have encountered the problem. The presence of pest and diseases, as well as natural calamities that attack and destroy the plants was experienced by (88.10%) of the respondents. Most of the respondent considered the high cost of inputs, lack of capital, lack of agriculture equipment and lack of government support as problems (Table 3).

DISCUSSION

Watermelon farming is a male-dominated wherein, farmers are young and middle-aged who might be open to new and innovative techniques and ideas in [4]. The farmers belong to average household size which is typical for Filipino families and is generally poor. The respondents rely primarily on farming as their source of income. Others are engaged in fishing as explained by the topographies of the localities involved in the study.

Watermelon farmers are not attending any training or seminar in watermelon production. According to the farmers who have attended seminars, the experts invited by the local government are not presenting any technology with regards to watermelon production. The lack of information, in turn, caused the non-participation of farmers to seminars or training organized by the local government or private companies. There is no existing organization of watermelon producers/growers in the three localities considered in the project. With this, there is a need to form an organization of watermelon producers/growers for them to avail more support from the government and other agencies. Farmers are found very willing to be members of organization whenever given a chance.

The area planted by the farmers is minimal considering that the localities are mainly agricultural. The farmers who are growing watermelon are generally engaged in small-scale production. The farmers partly owned and partly leased the land where they planted watermelon.

The variety commonly used by the respondents is sugar mommy together with Diana. The reason for using the varieties is mainly because these are the varieties that the buyers and consumers prefer. The sugar mommy variety produces an average of 7 to 8 kg fruit. With regards to the culture and management practices of the farmers, the farmers fertilize their plants using what they believed effective as products of their experiences. The farmers use inorganic fertilizers and pesticides but do not follow manufacturers' recommendation on the use of the chemicals. The farmers rely much on their long experiences on watermelon production. The farming experience was found to reduce technical efficiency [4].

The farmers have identified seasonality, the volume of production, and incidence of pest and diseases as the primary factors that affect profitability in watermelon production. In response to this, some of the farmers start planting watermelon in August for them to be able to bargain higher price during the months of November and December. Production is lessen during the hot months to avoid loses due to pest infestation such as thrips. Most of the farmers engaged in watermelon production in single cropping. This is connected to irrigation problem in the locality. Those who engage in double cropping usually change their production site by renting piece of land where there is available water supply. Watermelon production is profitable and it helps the farmers in improving the quality of their lives.

CONCLUSION

Watermelon farmers are mostly males, young and middle-aged who might be open to new and innovative techniques and ideas in farming; married and belong to

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a household with average size. The farmers are basic education graduates and poor. The farmers rely on their experiences in watermelon production and do not embrace innovative practices. Farmers do not follow manufacturers' recommendation in applying fertilizers and pesticides.

Watermelon production is highly profitable, however, as caused by various constraints such as lack of capital, the farmers do not engage in large-scale production. Watermelon production is highly beneficial to the farmers' families as it improves the quality of their lives. With the non-existence of farmers' organization, the farmers engaged in watermelon production do not receive adequate government support.

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