Recent Developments of Protected Cultivation in the Philippines

Armando N. Espino, Jr. and John James F. Malamug

CLSU Land & Water Resources Management Center
Benguet State University

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The Philippines

- The Philippines is an archipelago of 7,100 islands extending about 1,851 km north to south and with a maximum breadth east to west of 1,070 km.
- The Philippines is the third most disaster-prone country in the world with vulnerabilities to typhoons, volcanic eruptions, and earthquakes.

Population History

<table>
<thead>
<tr>
<th>Year</th>
<th>Population</th>
<th>Growth Rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>2005</td>
<td>85,368,811</td>
<td>1.89%</td>
</tr>
<tr>
<td>2006</td>
<td>86,867,136</td>
<td>1.76%</td>
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<td>2007</td>
<td>88,277,204</td>
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<td>2008</td>
<td>89,631,312</td>
<td>1.53%</td>
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<tr>
<td>2009</td>
<td>90,969,498</td>
<td>1.49%</td>
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<tr>
<td>2010</td>
<td>92,340,392</td>
<td>1.51%</td>
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<td>2011</td>
<td>93,770,068</td>
<td>1.55%</td>
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<td>2012</td>
<td>95,259,278</td>
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<td>2013</td>
<td>96,794,499</td>
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<tr>
<td>2014</td>
<td>98,355,183</td>
<td>1.61%</td>
</tr>
<tr>
<td>2015</td>
<td>99,919,043</td>
<td>1.59%</td>
</tr>
<tr>
<td>2016</td>
<td>101,498,763</td>
<td>1.58%</td>
</tr>
</tbody>
</table>

The population of the National Capital Region (NCR) as of August 1, 2015 was 12,877,253 based on the 2015 Census of Population (POPCEN 2015).

Temperature and Rainfall in the Philippines

- The mean annual temperature of the Philippines is 26.6°C. The mean annual temperature of Benguet Province with an elevation of 1,500 meters is 18.3°C.
- The mean annual rainfall of the Philippines varies from 965 to 4,064 millimeters annually.
- Baguio City, eastern Samar, and eastern Surigao receive the greatest amount of rainfall while the southern portion of Cotabato receives the least amount of rain.

Climate change in the Philippines

The Philippines exhibited increasing temperatures. The graph of observed mean temperature during the period 1951 to 2010 indicate an increase of 0.648°C.

Analysis of trends of tropical cyclone occurrence show that an average of 20 tropical cyclones form and/or cross the Philippine Area of Responsibility (PAR) per year.
The Philippine vegetable industry contributes more than 30% to total agricultural production, and is a major component of gross domestic product. The challenge is to develop a production system that adequately meets the need for year-round production of safe and high-quality goods. It is difficult to meet this need with conventional field production of crops because of erratic and high rainfall occurrences.

Vegetable production in the Philippines is highly seasonal in response to temperature, rainfall, and the frequency and intensity of typhoons. Despite the natural conditions which limit year-round production of many vegetables, farmers continue to take the risk of planting under adverse conditions expecting to get exceedingly high prices when the supply is compromised. To take advantage of higher prices for off-season vegetables, there are growers that plant pahuli (late crop), which is the late, dry season crop produced from February to May and palusot which is the wet season crop produced from August to October. The term palusot refers to the risky nature of planting during that period.

Cordillera's agricultural sector, according to the Philippine Statistics Authority (PSA), is the top producer of highland vegetables such as lettuce, broccoli, strawberry. Top producer of cabbage in the Philippines, with the region contributing 77.4% of the country's cabbage production. Top producer of carrots, with it producing 88.8% of the national production.

Strawberry production is adversely affected by changing weather patterns. In 2012, the Municipal Agriculture Office (MAO) of La Trinidad reported a yield decrease from 21 to 16 tons/ha of strawberry (Caluza 2012; Catajan 2012) due to erratic rainfall patterns particularly during the strawberry season.

In 2000, the Central Luzon State University (CLSU), and the Asian Vegetable Research and Development Center (AVRDC), Taiwan promoted the use of rainshelters and net coverings to protect vegetables from heavy use of insecticides and fungicides and the shattering effect of rainfall. In 2002, the Israeli Government put up two units of Israel-model greenhouse at CLSU. CLSU established the “greenhouse village” in the campus.
Programs on Protected Agriculture

- In 2003, the Agencia Espanol de Cooperacion International (AECI) and the Department of Agriculture (DA) in Central Luzon implemented a program entitled “Support Program to Vegetable and Fruit Production in Central Luzon” resulting to the construction and operation of 20 units of greenhouses in Tarlac, Pampanga and Bulacan.
- In 2010, the Nueva Ecija Provincial Government’s constructed 160 units of protective structures for 16 towns of the province.
- The Provincial Government’s Fruits and Vegetables Seed Center at the Central Luzon State University (CLSU), Science City of Muñoz has eight (8) units of greenhouses/tunnel structure.

Programs on Protected Agriculture

- The Department of Agriculture-Regional Field Units (DA-RFU) turned over 14 rain shelters worth P4.2 million to Northern Mindanao Vegetable Producers’ Association (NorminVeggies). NorminVeggies provided a counterpart fund of P1.2 million, while the DA provided P3 million. Each rain-shelter unit costs P300,000.
- Using bamboo, lumber and UV-treated plastic roofing, the DA-RFU Regional Agriculture Engineering Division designed the indigenous “rain shelters” and funded under the High Value Commercial Crops Program whose objective is to fulfill food security requirements by enhancing the ability to produce high value crops.

Organizing Greenhouse Harvest Festival
Provincial Government of Bulacan
Showcasing protected cultivation technology

Provincial Government of Bulacan

Greenhouse projects and other food production programs are also being supported by the National Economic Development Authority (NEDA) in partnerships with LGU.
Types of Protective Structures in the Philippines

Plastic Mulch

Plastic mulch for lettuce production in La Trinidad, Benguet

Plastic mulch for Strawberry Production

Plastic mulch for Tomato Production
San Ildefonso, Bulacan

Plastic mulch for Bell Pepper Production
Nueva Ecija
Plastic mulch for Hot Pepper Production
San Ildefonso, Bulacan

Plastic mulch for Sweet Pepper Production
Nueva Ecija

Net Tunnels

Low tunnels for Lettuce Production
Benguet

Low tunnels for Strawberry Production
La Trinidad, Benguet
Low tunnels with bamboo frame
Benguet

Modified Low tunnels for Lettuce Production
Silang, Cavite

Low tunnels for Lettuce Production with mulch
Silang, Cavite

Rainshelter and Shadehouse

Rainshelter with shadenets for Lettuce Production
Nueva Ecija
Net houses do not provide complete protection against rain and insect pest entry but reduces impact of rain.

Non-circulating Hydroponics System

A plastic house is a relatively simple structure made of iron pipes or wooded frames covered with soft plastic films or plastic nets.
East West Seed Greenhouse Model

Green Garden, Castillejos, Zambales

BSU Campus, Benguet

Sweet Spring, Tagaytay, Batangas

Bamboo Greenhouses
Protected cropping structures in Australian Centre for International Agricultural Research (ACIAR)-Visayas State University (VSU) Project constructed with bamboo frames

Valley Fresh Garden Farm
Barangay Dahilayan, Manolo Fortich, Bukidnon

Good Food
Capas, Tarlac, Philippines

Earth Flora Inc
Bukidnon, Philippines

Commercial Farms Using Protected Cultivation Technologies
Green Garden, Castillejos, Zambales

Agriculture

Johnson Huang
10-ha farm
150 greenhouses

Taiwanese Vegetable Grower
Brings Life to Sleepy Zambales Village

Ato Belen’s Farm

Ato Belen’s Farm offers Training on Organic Agriculture

Gourmet Farms
Natividad Farm
Silang, Cavite

Yoki Farm
Silang, Cavite

Natividad Farm
Silang, Cavite

Natividad Farm
Silang, Cavite
Yoki Farm
Silang, Cavite

Single Span Greenhouses
Eden Nature Park
Davao City

Multispan Greenhouses
Eden Nature Park
Davao City

Benguet Strawberry Farm
Island Rose cultivates its flowers in the most modern greenhouse facility in the Philippines. At Island Rose, a computer measures internal and external weather conditions and adjusts ventilation, shading, misting, and cooling fans to give its crop the ideal growing conditions. Water and plant food are controlled via computer so that the plants get the nutrients at exact amounts making them healthy while avoiding wastage.
Vegetable Seedling Production: A Booming Business

East West Seeds Farm Ready San Ildefonso, Bulacan

Daisy Duran’s Farm Seedling Production and Sales San Ildefonso, Bulacan

JL Seedling Farm Talavera, Nueva Ecija
Design of Commercially Available Protected Cultivation Structures

Commercial Greenhouses
Establishment of demo farms for protected cultivation

Nethouses

Establishment of demo farms in secondary school for technology promotion

Farmer cooperator of the project in Bulacan

CLSU’s Program on Protected Cultivation
Farm visitation by Parents of High School Students

Participants of CLSU’s Protected Agriculture Training

Provided assistance to Local Government Units (LGUs) in their Protected Cultivation Program

Seedling Production
Distribution of Seedlings to farmers

Working with local government units in providing extension services
AMORE Livelihood Project
Maguindanao, Mindanao

Planning with stakeholders’ participation

Kalinan District, Davao City

Current R&D Works on Protected Cultivation

Response of selected vegetables to different shadenets
Benguet State University

2017/9/29
Drip irrigated onion and garlic in greenhouse
Central Luzon State University

Installation of soil moisture sensors

Initial results:
- Higher marketable yield
- Uniform bulb sizes
- Less water required

Indoor Farming Researches by Students

Design, Fabrication and Evaluation of a Semi-Automated Small Scale Greenhouse for Whole Year Round Production of Selected High Value Crops in Lowland Tropics

CLSU Center for Hydroponics and Aquaponics Technology

Dr. Chito Sace, Project Leader of CHAT
The Bureau of Agricultural Research published a book in 2009 on "Protected Vegetable: Management Option and Economic Potential". Yield and return from different types of protective structures were analyzed in this book. The authors cited factors to consider in protected cultivation of vegetables:

1. Profitability (production costs, transportation costs, etc.)
2. Ability of the enterprise to compete
3. Availability of resources (financial capital, water, etc.)
4. Knowledge/Management skills

Rate of Adoption

- In the Philippines, protected cultivation is an emerging industry from small-scale operations to commercial farms.
- There is slow adoption of protected cultivation in the country and this is primarily due to the huge and risky investment it entails. A simple 100 sqm greenhouse costs US$2,000. This is beyond the capacity of a common farmer to invest. Due to lack of capital, the Filipino farmer is forced to rely on his crops’ seasonality and its accompanying problems.

Development of a Cost Effective Protective Structure

- The country still has limited information on protective crop production technology (structural design, crop selection, management, market) and considering the impacts of climate change to agriculture, adoption has to improve.
- Development of a cost-effective protected vegetable cropping system will allow farmers in high rainfall areas to sustainably produce high value crops for increased income and food security.

Appropriate Design

- Efforts to determine standard greenhouse design in the country that is technically and economically viable will certainly contribute to accelerating farmers’ adoption of protected cultivation.
- Design considerations that must be improved include:
  - lowering the cost per unit area,
  - resistance against strong winds,
  - the use of natural ventilation avoiding high energy costs,
  - use of indigenous materials among others

Infrastructure and Training Support on production under protected cultivation

- We have very limited training on greenhouse production technology. Seed companies and greenhouse suppliers are the ones conducting such trainings mostly for their customers.
- A continuing national program on protected cultivation is in order that includes providing support services in terms of subsidies to the construction of protective structures, access to high-value vegetable seeds, training on cultural management under greenhouse, and regular technical assistance.
- Protected cultivation technology topics should be integrated in the curriculum of agricultural courses in the Philippines.
Conclusion

- The food demand is increasing day-by-day due to exponentially increasing population of the country, hence, there is an urgent need of appropriate technology in the field of agriculture to meet the food requirements of the population amidst the impact of climate.
- The utilization of protective structures in the Philippines are slowly attracting growers of high value vegetables and other crops because the protection it provides against prolonged rainfall and other unfavorable climatic conditions.
- The major challenges for the adoption of the protected cultivation are lack of awareness, cost effectiveness of the methods and structures and lack of market linkages.
- Protected cultivation is still in its infancy stage in the Philippines and knowledge sharing and access to information is important to us.