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A Review on the Status of Crop Production Innovations of the Philippines

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Abstract

The status of innovations strategies in crop production of the Philippines needs to be assessed to determine the country's ability to reach optimum productivity and income. Furthermore, the rising demands for food coming from a rapidly growing population have also heightened the significance of seeking a more productive and safer food. Thus, there is a need to identify and assess these innovations strategies of crop production in the Philippines. Thus, this paper aims to: identify innovative strategies in the field of crop production in the Philippines, assess current advances of technology in the field of crop production in the Philippines, and discuss the importance of innovations and advances in the field of crop production. The highlight of research findings on the innovative strategies that have been imposed by the researchers through practicing some smart farming innovations (SFI) and digital agriculture (DA). Advances, on the other hand, include the use of F1 seeds, solar power irrigation system, the website for crop planning (Farmers' Guide Map and Agri-information support portal), and the different applications that have been developed as well (Rice Crop Manager, AgriDOC, and KROPS). This improvement helped the farmers inefficient use of water, fertilizer, and other agricultural inputs in an environmentally friendly way to boost crop productivity while maintaining a safer environment for the farmers and the people. For instance, it is concluded that the innovations above and advances in technology in crop production of the Philippines will be one of the milestones in attaining a specific goal for everyone. And that is to increase the ability of the country to produce a sufficient amount of food for every Filipino family. At the same time, the approach will maintain sustainability and reduced the impact on the environment as long as these technologies are correctly managed.

Keywords: Farming innovation, efficiency, sustainable environment, and productivity

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INTRODUCTION

Despite the plan to industrialize the economy in 2000, the Philippines is still primarily an agricultural country where most citizens still live in rural areas and support themselves through agriculture. The country's agriculture sector comprises four sub-sectors: farming, fisheries, livestock, and forestry (the latter two sectors are tiny), which together employ 39.8 percent of the labor force and contribute 20 percent of GDP (Nations Encyclopedia, n.d.).

Crop production mainly belongs to the farming sector. As of the second quarter of 2020, the agricultural production status in the Philippines managed to grow 0.5 percent. 5.0 percent growth in production. It shared 53.7 percent of the total agricultural output, where palay went up by 7.1 percent and corn by 15.4 percent. At current prices, the value of agricultural production amounted to Php. 439.8 billion. This was 4.6 percent higher than the previous year's level (PSA, 2020).

Currently, the Philippines faces many problems in the agricultural sector, which employs around 37 percent of people in the country, being a major source of income for many households. Yet, this sector's share in the country's GDP has gone down over the years, showing a decline. The Philippines government is also decreasing funding for agriculture. Starting in 2011, agriculture only makes up about 4 percent of the national budget. This makes agricultural development in the Philippines questionable. Worse, the Philippines is notoriously vulnerable to natural disasters, facing around 20 typhoons each year. For farmers, one typhoon or tropical storm could be enough to wipe out the entire crop. Starting over with the work can be expensive and time-consuming. For example, coconut farmers need up to 10 years for their crops to grow. The lack of financial support coupled with frequent natural disasters leaves farmers in a compromising state. As a result, 57 percent of agricultural households are impoverished. In comparison, non-agricultural households are three times less impoverished. This rate is even worse in agricultural-dependant areas and reaches up to 74 percent in Central Visayas (Massarath, 2018).

Philippine agriculture may be characterized, among others, by limited diversification and low productivity. The limitation in diversification and low productivity are considered the two most important challenges which constrain agricultural production and limit the capacity of the country to harness the full potentials of the growing local and international markets. Other ASEAN countries have generally prioritized diversification in the agriculture sector, exhibiting better agriculture performance than in the Philippines. For instance, crop yields are generally lower in the Philippines compared to other countries in the region. As a result, the country is growing behind in long-term total factor productivity in agriculture. Low agricultural productivity is an even bigger challenge. Long-standing challenges that hamper productivity include limited access to credit and Agricultural insurance, low farm mechanization, and inadequate postharvest facilities, inadequate irrigation, scant support for research and development (R & D), weak extension service, incomplete agrarian reform program implementation, and aging farmers and fisherfolks. There is also limited connectivity between production areas and markets and poor compliance with product standards resulting in low competitiveness of agriculture, forestry, and fisheries (FFTC-AP, 2018).

Furthermore, FFTC-AP described that to address the aforementioned constraints in agricultural production (specifically in crop productivity), investment in technology, innovation, and the necessary support services are the key factors that concerned agencies consider. Thus, the country's institutional framework or national agricultural development plan is embedded in the Philippine Development Plan 2017-2022, mainly on Chapter 8: Expanding Economic Opportunities in Agriculture, Forestry, and Fisheries had been formulated with an aim in expanding economic opportunity for those who are already engaged in producing agricultural products and increase access to economic opportunities for small farmers who are typically subsistence farmers with limited market participation.

The strategies stated in the plan include raising investments in R & D for production and postharvest technologies, enhancing the capacity of small farmers and fisherfolks to adapt better and new technologies, and innovative access financing. Therefore, this paper aims to identify recent innovations and advances in crop production in the Philippines with the previously mentioned strategic plan. Specifically; to identify the innovative strategies in the field of crop production in the Philippines, to assess current advances of technology in the field of crop production in the Philippines, to discuss the importance of innovations and advances in the field of crop production.

A REVIEW

Status of Philippine Agriculture

The agriculture sector mainly dominates the economy of the Philippines. Agricultural operations provide 40 to 45 percent of the total national income and about 75 to 80 percent of the country's exports. Food crops account for about two-thirds of the total production (tonnage) and about three-fourths of the cultivated acreage. The main crops usually cultivated for local consumption are rice, corn, and sweet potatoes. In keeping with the national emphasis on increased food production, there has been a consistent but not rapid increase in acreage devoted to these and other food crops. The increase in fruit and vegetable production has been quite significant. Double cropping of rice, corn, and some vegetables is practiced in many areas but is not general. Agricultural production, therefore, furnishes employment to about 3 million persons or about 60 percent of the gainfully employed workers where it provides 40 to 45 percent of the total national income and about 75 to 80 percent of the country's export (Cutshall, 1958)

The agriculture sector had loomed larger when it comes to employment, with nearly two-fifths (i.e. 37 percent) of the jobs are generated by the sector. Still, the services sector accounts for more or less half of both output and jobs in the economy. Unfortunately, the agriculture economy tends to fluctuate dramatically every quarter, manifesting similar volatility in its growth performance. The dramatic slowdown from various quarters had been caused mainly through unfavourable weather conditions. Notwithstanding these challenges, the agriculture sector is still recognized with incomparable value in overall economic development, first, as a source of raw materials and food for the rest of the economy. Second, it provides a significant market for the products of the non-agricultural economy. And third, as the sector grows and modernizes in the face of limited supplies of agricultural land. With 70 percent of the country's poor coming from the rural areas where agriculture is the dominant source of livelihood and employment, the importance of agriculture to the Philippine economy cannot be over-emphasized. Thus, the Medium Term Philippine Development Plans (MTPDPs) of successive administrations have consistently recognized the critical importance of energizing and modernizing the agricultural sector in the overall pursuit of vigorous and broad-based economic growth and development. But as we discuss below, success with this goal has continued to be elusive (Habito *et al.,* 2005).

RESULTS

Innovative strategies in the field of crop production in the Philippines

Use of Smart Farming Innovations (SFI)

SFI or Smart Farming Innovations is motivated by the 5th-agendas of the current Philippine President to increase agricultural and rural enterprise productivity. The study presents a strategy to lead research, development, and market of organic foods as medicine and build social entrepreneurs in using SFI. The researchers assumed the currently established protocols for micropropagation, cryopreservation, and management of vegetables, vertical farming and hydroponics, and monitoring in real-time of the climate, lighting, irrigation through the use of electronics, sensors, and automation in proposing the SFI to map the producers and market of organic foods, and finally build the cluster of social entrepreneurs in using the SFI smart technologies organic farm systems. It was found that scalable technology-driven products and services are an organic food production requires a certain radius to be effective and efficient. Therefore, it must consider setting up e-commerce, cloud computing, power and security, and utilizing big data analytics to aid in timely decision-making scaling up in the future (Matero *et al.*, 2020).

Digital Agriculture

Digital technology and innovations was a program introduced by the Department of Agriculture that includes e-Kadiwa and data analytics. These will be leveraged throughout the food value chain logistics, starting with the efficient distribution of inputs to farmers enrolled in the Registry System for Basic Sectors in Agriculture (RSBSA). The automated system will improve farm productivity and cut waste by using analytics to facilitate data-driven farming practices for small farmers. In addition, the status of crop production will be monitored using digital databases, strengthening the digitalization for "Agriculture 4.0" (D.A. n.d.). Thee-Kadiwa system was launched by the Department of Agriculture (DA) and private sectors on May 4, 2020, which is further described as an online marketing platform that can directly link producers, agripreneurs, and consumers. In his speech, DA secretary William Dar has said, "Through eKadiwa, we strengthen our commitment to providing every Filipino family a convenient and easier way to buy fresh, nutritious, and safe food products by simply using a mobile phone or computer". Customers only need to visit eKadiwa.da.gov.ph, where they can order a wide range of fresh and affordable farm and fishery products from three merchants: AgriNurture, Inc. (ANI); Zagana, Inc.; and Benjabi Ventures Corp. The ordered goods will be paid initially through cash-on-delivery (COD) or bank transfer. After that, the goods will be delivered initially via Mober, Inc. In addition, other transport and delivery service providers like Lalamove and Grab have signified joining the eKadiwa project.

The eKadiwa will initially cover Metro Manila and eventually expand to other major urban areas nationwide. ANI President and CEO Antonio Tiu said: "This is an opportunity for us to showcase our 'Bayanihan spirit and take part in the agriculture sector's paradigm shift towards modernization. This is a good example of a successful public-private partnership." "eKadiwa could be the biggest e-commerce site in the agriculture sector," he added.

Asked about the prospects of eKadiwa, Basil Bolinao of Mober Inc. said they are expecting a peak of 20,000 deliveries per day in Metro Manila. In all, the food supply chain will always be a part of 'essential services, with or without covid-19. The eKadiwa further expands ‘Kadiwa ni Ani at Kita,’ complementing regular outlets and rolling stores in Metro Manila and other areas nationwide (Bejarin, 2020).

Advances in technology in the field of crop production in the Philippines

Technology advancement had been the focal reform intended to Philippine agriculture. Aside from using F1 hybrid seeds in the year 2018, the country also had to make use of and completed the so-called "solar-powered irrigation system" in May. DA Secretary Manny Piñol has said that it has the ability to irrigates up to 500,000 hectares. Recorded in the same month are the Japanese-made drones that have been utilized in three Benguet towns to spray the fertilizer on mountain slopes to decrease the farmers' hours in the field. In addition to these, the government had created a website intended to help farmers in crop planning called Farmers Guide Map, with different applications that have developed. Such as Rice Crop Manager app, AgriDOC app, and KROPS with the main focus on assisting the farmers in identifying suitable crops to be planted on their lands, provide data on climate conditions and soil adaptability, provides recommendations to farmers in crop management based on their farm conditions, and to help them market their products at their prices and help potential buyers find sources of farm products within their area (Malasig, 2018).

On March 9, 2020, it was mentioned by AR that a web-based support system called "Agri-Information Support Portal" will be developed by the Department of Agriculture, headed by DA Secretary William Dar to link farmers and fisherfolks to aiding bodies that can address the commonly occurring issues efficiently for them as they move forward. This online portal is a nationwide initiative that will weave together regions of the DA, linked agencies, and bureaus to keep all parties in a single loop on agricultural advances and efforts. The system will encourage farmers and fishers to be more digitally aligned, technologically capable, and generally more innovative regarding how they carry out their processes. These will also provide improved sourcing of agriculture data and information to keep players consistently up-to-date at all times. In addition, it will enhance decision-support mechanisms that will be offered on the portal alongside speedy reporting of programs and projects. This initiative is a progressive step that will encourage other digital initiatives that DA has in-store. According to Secretary Dar, the development of the system will help industrialize the country's agriculture sector that will signify the establishment of a department-wide policy framework that focuses on the concept of "New Thinking for Agriculture" and for the Philippines to direct its efforts towards digitizing farming and agriculture businesses that will also involve the children of the farmers as infomediaries of the technologies they can get from this agri-information support portal. Furthermore, in the future, it is hoped that private bodies and digital players will also take part on the said digitization efforts to transform and bolster the Philippines' agriculture sectors as they will increase the importance and relevance to the economy as market demands jump and greater reliance on food security is attained.

Importance of innovations and advances in the field of crop production

Today's agriculture, inevitable innovations and advances in technology had routinely utilized high-end technologies such as robots, temperature and moisture sensors, aerial images, machines, information technology and GPS technology transformed farms and agricultural operations work far differently than those past few decades. Primarily, the advanced devices and precision agriculture and robotic system allow businesses to be more profitable, efficient, safer, and more environmentally friendly. Through these aforementioned technologies, farmers will no longer have to apply water, fertilizers, and pesticides manually across a huge field. Instead, they can use the minimum quantities required, target very specific areas, or treat individual plants differently. The advantages include higher crop productivity, decreased use of water, fertilizer, and pesticides, which in turn keeps food prices down, reduced impact on natural ecosystems, less runoff of chemicals into river and groundwater, increased worker safety. In addition, robotic technologies enable more reliable monitoring and management of natural resources, such as air and water quality. It will as well gives producers greater control over plant and animal production, processing, distribution, and storage which results in: greater efficiencies and lower prices, safer growing conditions and safer foods, and reduced environmental and ecological impact (NIFA-USDA, n.d.).

In most cases, current development and advances in technology had broadened the breadth, scale and immediacy of what these technologies can deliver. Advances *in situ* and remote sensing technologies have significantly increased the spatial and temporal resolution of physical measurements and allowed for low-cost, automated measurement of many aspects of agricultural production that were previously only able to be measured in a limited way – for example, at discrete points in time by a human observer conducting a field visit. Advances in massive data acquisition, storage, communication, and processing technologies have enabled the rapid transfer of vast quantities of data which would not have been possible even a decade ago. They have greatly magnified the ability to process large datasets and automate analytical processes with machine learning (OECD, 2019). Furthermore, advances in technology and farming practices have helped farmers become much more productive, growing crops efficiently in areas most suitable for agricultural production. Without these advances, far more land would need to be cultivated to produce the food we need today. For instance, it has been estimated that we could produce the same amount of total food grown fifty years ago on less than one-third the amount of land used back then. If yields had stayed the same since 1961, we'd need to cultivate more than double the amount of land to feed the population today – a shift from 12.2 billion acres to at least 26.3 billion acres. That's 82% of our total land area on earth (Farming First, n.d.).

CONCLUSION

Based on the condensed information from different researches, the following conclusions were drawn:

a. The innovative strategies in crop production in the Philippines include the use of smart farming innovations (SFI) and digital agriculture.
b. The current advances of technology in the field of crop production in the Philippines are the use of F1 seeds, solar power irrigation system, website for crop planning (Farmers' Guide Map and

Agri-information support portal), and the different applications that have developed as well (Rice Crop Manager, AgriDOC, and KROPS).

c. Innovations and advances in the field of crop production improved, continuously develop (as long as it is properly managed) and helped the farmers inefficient use of water, fertilizer, and other input in an environmentally friendly way to boost the crop productivity while maintaining a safer environment for the farmers and people as well.

For instance, it is concluded that the innovations mentioned above and advances in technology in cop production of the Philippines will be one of the milestones in attaining a specific goal for everyone. And that is to increase the ability of the country to produce a sufficient amount of food for every Filipino family. At the same time, the approach will maintain sustainability and reducing the impact on the environment.

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