Improving the Estimation Methodology of Cultivated Biological Resources in the Philippine System of National Accounts

by

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ABSTRACT

Amid the emergence of new economies, it is recognized that enhancing and capturing the contribution of agriculture in the economy is important considering the development plans of the current administration and the proportion of the population engaged in this sector. In line with the overall revision and rebasing of Philippine System of National Accounts, the conduct of field visits and the updating of parameters were implemented to provide more accurate and reliable estimates for breeding stocks and orchard development. It is acknowledged that the initial efforts are developmental in nature and still subject to analyses and further improvement. It was noted that there are data gaps and challenges that need to be addressed urging the cooperation and support of policymakers, data providers, and compilers of censuses, surveys, and administrative-based data.

I. Introduction

Despite many criticisms, the performance of an economy through the estimation of its Gross Domestic Product (GDP) is still one of the measures being considered by most planners, investors, and even political leaders to assess national development, stability, and sustainability. It is therefore important that all economic activities of a given country are measured accurately and are reported timely as regular as possible. To ensure comparability among countries, a publication on the System of National Accounts (SNA), an internationally-agreed framework and recommendations which aims to guide compilers and users of the national accounts, is released and updated regularly. The GDP can be measured using three approaches; namely, production, expenditure, and income. In the Philippines, the quarterly GDP are presented on both production and expenditure approaches, while the income approach is only released on an annual basis.

The agriculture sector has been in the limelight for a number of years mainly because of its low performance as measured by its contribution to economic growth. In the 2008 SNA, the capital accounting attributed to agriculture, in particular for permanent crops and animals, is classified under cultivated biological resources. As defined in the 2008 SNA, cultivated biological

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resources cover animal resources yielding repeat products and tree, crop and plant resources yielding repeat products whose natural growth and regeneration are under the direct control, responsibility and management of institutional units. In the expenditure side of the Philippine System of National Accounts (PSNA), these cultivated biological resources are captured under Breeding Stocks and Orchard Development (BSOD). Based from the latest published results, the share of BSOD to GDP has been declining from 2.3 percent in 1998 to 1.0 percent in 2018, while exhibiting an annualized growth rate of 1.1 percent in the past ten years.

It must be noted that one in every five employed Filipinos is engaged in agriculture, hunting, and forestry based on the results of the Labor Force Survey (LFS) in July 2019. From the 2012 Census of Agriculture and Fisheries (CAF), one fourth of the total farms or holdings in the Philippines, covering 3.3 million hectares, are devoted to permanent crops. From the CAF results, it must be noted that the total agricultural farms was 9.6 million hectares in 2002, down to 7.2 million hectares in 2012.

In the production side of the national accounts, BSOD activities are closely tied with those included under Agriculture, Forestry, and Fishing (AFF). Based on the Philippine Development Plan (PDP) 2017-2022, it is targeted that crops, and both livestock and poultry to grow by 2.0 to 3.0 percent and 3.0 to 4.0 percent, respectively. The Duterte administration envisioned to expand and to increase access to economic opportunities for those engaged in AFF activities, especially the small farmers and fisherfolk.

The Philippine Statistics Authority (PSA), mandated to estimate the national accounts of the country, is committed to continuously improve its process in accordance with the SNA recommendations. Geared towards the overall revision of the PSNA as well as recognizing the weaknesses of the current BSOD estimation, in particular, the PSA has initiated the conduct of field visits to accurately account the cost of investments for orchard development. The use of updated parameters for the sector were also undertaken.

II. Methodology

It may be useful to look into country practices on capturing the contribution of cultivated biological resources. This section provides information on the 2000-based and proposed 2018-based methodologies, methods being employed by some countries, and the conduct of field visits in selected provinces.

2000-Based Estimation Methodology

The capital formation on breeding stocks was estimated using data on inventory of animals by type from the Survey of Commercial and Backyard Livestock/Poultry Farms and the corresponding farm gate prices from the Monthly Survey of Farm Prices and Auction Markets of the former Bureau of Agricultural Statistics (BAS). The ratio of livestock and poultry used as fixed capital and the undercoverage ratio were obtained from the results of the Census of Agriculture (CA). For the estimation of capital formation for orchard development, the data on the total area devoted to permanent crops

were obtained from CA and the cost per hectare for the development and maintenance of plantation crops came from BAS.

The estimation methodology of capital formation for breeding stock is computed using the formula

$$\boldsymbol{BS = \sum (EI_i \times r_i \times lw_i \times P_i) \times UCR}$$

where BS = gross fixed capital formation in breeding stocks and other animals used as fixed capital
EI_i = ending inventory of the animal type
r_i = ratio of the animal type in the breeding stock
lw_i = average live weight of the animal type in the breeding stock
P_i = farm prices of the animal type in the breeding stock
UCR = undercoverage ratio for total breeding stock

A ratio was multiplied to the ending inventory of the animal type in order to get the number of animals intended solely for breeding purposes. On the other hand, undercoverage ratio was used to account all other livestock and poultry used for breeding. However, the parameters used for these ratios were from the 2002 Census of Agriculture (CA); thus, a need to use and incorporate updated parameters to the estimation of BSOD to capture improvements and developments.

The estimation methodology of capital formation for orchard development is computed using the formula

$$\boldsymbol{ORCH = AP \times C \times UCR}$$

where ORCH = gross fixed capital formation in orchard

AP = area planted to permanent crops (in hectare)

C = total development and cultivation cost per hectare

UCR = undercoverage ratio

The value of fixed capital formation on orchard development and other permanent crops used as fixed capital is derived as the product of area planted to permanent crops and the total development and cultivation cost per hectare. An undercoverage ratio of 20 percent is also applied to account all other permanent crops not covered by the 2002 CA. However, data on the area planted to permanent crops from the 2002 CA covered only major plantation crops. In addition, parameter used for the undercoverage ratio is based from the 2002 CA, hence, a need for an updated or new parameter.

Methods used in other countries

Based from the 2008 SNA, capital formation can be estimated in at least three ways. The most common is the perpetual inventory method (PIM) which is used by many countries such as the United States of America, Australia, France and Singapore. Basically, the 2008 SNA tells that PIM writes down the value of all assets existing at the beginning of the year in question by the reduction in their value during the year, eliminates those assets that reach the end of their useful lives in the year and adds the written-down value of assets acquired during the year. To apply the PIM, assumptions on service life, discard pattern and depreciation method are required.

Capital formation can also be measured using commodity flow approach. This approach utilized survey and administrative-based data on the supply of materials or goods intended for use as fixed capital formation. This method is applied to estimate the capital formation of Indonesia wherein Manufacturing Industries statistics and Foreign Trade statistics are the main sources of data.

In the case of Switzerland, the data directly taken from their economic and satellite accounts added to the total investment in capital goods are the investments in capital formation in cultivated assets.

Conduct of field visits in 2017 and 2018

As part of the overall revision and rebasing of the PSNA, field visits were conducted in selected provinces with fruit farm households and establishments. These field visits were geared towards gathering indicators and parameters that would improve the estimation methodology of BSOD. The sample of permanent crops were selected by determining the top permanent crops with the largest total volume of production, vis-à-vis suggestions raised during the meeting with Agriculture and Fisheries Census Division (AFCD) and Crop Statistics Division (CSD) of PSA. The selected sample crops were coconut, coffee, rubber, mango, cacao, and calamansi. The sample provinces were determined in consultation with AFCD and CSD: Quezon (coconut), Cavite (coffee), Zamboanga Sibugay (rubber), Negros Occidental (mango), Davao del Sur (cacao), and Oriental Mindoro (calamansi). The updated List of Establishments was utilized in the selection of sample farm establishments for rubber, mango, and cacao. The top four farm establishments by number of employees were later selected. On the other hand, the sample households for coconut, coffee, and calamansi farms were selected in coordination with the PSA provincial staff of Quezon, Cavite, and Oriental Mindoro, respectively.

From the field visit results, it showed that a larger portion of the total expenditure is allotted for labor than for material inputs, fertilizers, and other costs, except for calamansi.

Table 1. Share of inputs to growing of various permanent crops

Item	Cacao	Calamansi	Coconut	Coffee	Mango	Rubber
Materials	0.23	0.53	0.17	0.10	0.11	0.29
Labor	0.77	0.47	0.82	0.90	0.89	0.71

The computed average annual cost per hectare prior to harvest by commodity for the years 2010 to 2018 is given below. It should be noted that the expenses cover all those incurred for newly planted crops for the year and for those planted in previous years and are still not yielding products:

Table 2. Annual average cost per hectare prior to harvest, by commodity, 2010 to 2018

Commodity/Year	2010	2011	2012	2013	2014	2015	2016	2017	2018
Cacao	172,602.6	207,281.1	183,106.0	173,296.3	186,163.2	207,858.3	205,812.7	220,414.6	210,766.0
Calamansi	163,117.5	195,890.3	173,043.8	163,773.1	175,932.9	196,435.9	194,502.6	208,302.1	199,183.7
Coconut	81,306.1	97,641.7	86,253.8	81,632.8	87,693.9	97,913.6	96,950.0	91,549.8	87,542.2
Coffee	108,410.9	130,192.3	115,008.0	108,846.6	116,928.2	130,554.9	129,270.0	122,069.5	116,726.0
Mango	572,781.0	648,404.0	685,108.1	637,755.9	571,190.3	576,867.6	538,651.6	508,648.1	486,382.2
Rubber	331,193.2	397,735.0	351,347.4	332,524.3	357,213.5	398,842.6	394,917.4	422,935.8	404,422.0

The number of years before crops yield products were also obtained from the field visit. The distribution of total spending across these years were also derived

Table 3. Distribution of total spending across number of years before crops yield products

Commodity	Number of years before crops yield products	Share to total expenses							
		Y1	Y2	Y3	Y4	Y5	Y6	Y7	Total
Cacao	3	0.40	0.30	0.30					1.00
Calamansi	3	0.54	0.30	0.15					1.00
Coconut	5	0.33	0.17	0.17	0.16	0.16			1.00
Coffee	3	0.68	0.15	0.17					1.00
Mango	7	0.25	0.13	0.13	0.12	0.13	0.13	0.13	1.00
Rubber	5	0.37	0.16	0.16	0.15	0.15			1.00

2018-based Proposed Methodology

Given the limitations of the 2000-based estimation methodology, the proposed methodology for BSOD is to use data on inventory of animals classified by age from the Backyard Livestock & Poultry Survey (BLPS) and from the Commercial Livestock & Poultry Survey (CLPS) of the Livestock and Poultry Statistics Division (LPSD) of PSA. Determining the age of the livestock will give us information on whether to account these as breading stocks or as inventory. The undercoverage ratio for the 2018-based estimation is from the results of the 2012 Census of Agriculture and Fisheries (CAF). Meanwhile, the farmgate price of each animal type is from the Farm Prices Survey of the Price Statistics Division (PSD).

The 2018-based methodology of capital formation for breeding stock is basically an updated version of the previous methodology wherein more recent parameters for the undercoverage ratio are used and the ratio of the animal type in the breeding stock is omitted with the availability of inventory data from the BLPS and CLPS.

On the other hand, field visit results are used as a parameter to estimate the cost associated with orchard development. The area planted/harvested for permanent crops of PSA were used to estimate for the newly planted areas in each year. Similar to breeding stocks, the undercoverage ratio for orchard development was estimated using CAF results.

III. Results and Discussions

Below is a comparison between the published and initial revised estimates for BSOD from the years 2010 and 2018 (unit in million pesos):

Table 4. Comparison of Published and Revised Estimates, 2010 to 2018

Item/Year	2010	2011	2012	2013	2014	2015	2016	2017	2018
2000-Based	173,493.9	178,640.3	181,021.6	180,080.8	165,981.4	172,474.2	188,839.0	216,089.5	246,990.8
2018-Based	248,563.4	235,453.2	234,621.9	245,584.8	227,410.8	231,114.9	258,635.1	279,665.1	312,327.2
Difference	75,069.5	56,812.9	53,600.3	65,504.0	61,429.4	58,640.7	69,796.1	63,575.6	65,336.4

Comparing the published and initial revised estimates, it was noted that there was an increase of around PhP 63.3 billion annually in levels, which represents around 33.4 percent increase on average from the published estimates. The new estimates exhibited an annualized growth rate of 2.9 percent from 2010 to 2018.

Figure 1. Comparison between the Published and Initial Revised Estimates for BSOD, 2010 to 2018

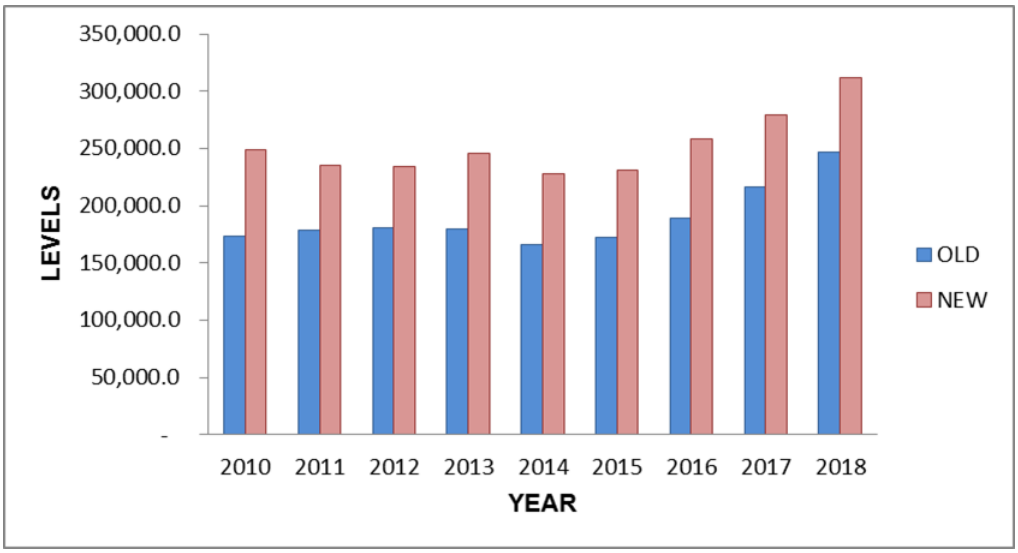

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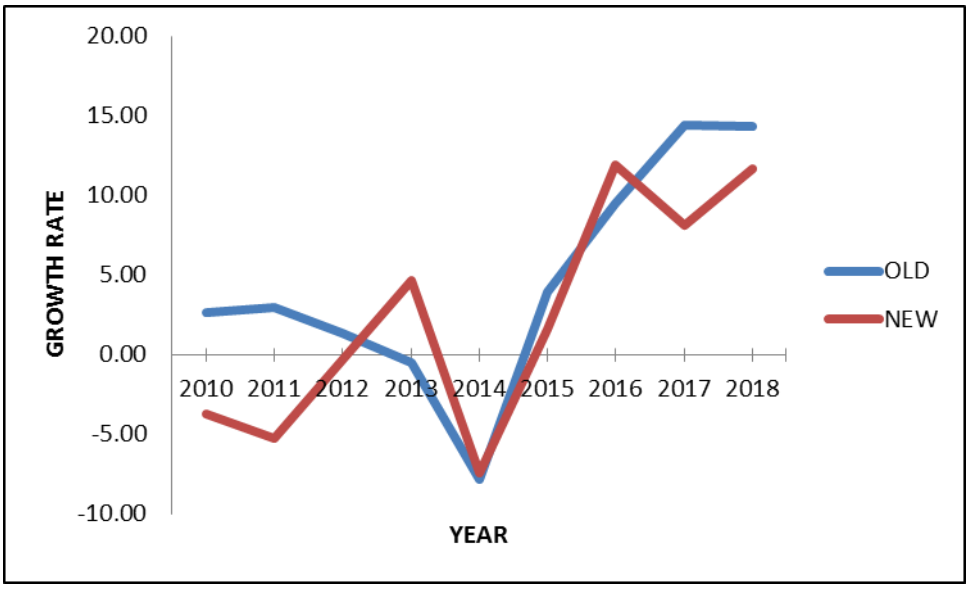
Figure 2. Comparison Between the 2000-Based and 2018-Based Growth Rate for BSOD, 2010 to 2018



IV. Conclusions and Recommendations

It is important that there should be a comprehensive and accurate recording of the national accounts to reflect current economic trends, which will serve as bases for identifying policies, programs, and other interventions. By looking at the performance of the agricultural sector in the past years, it may be easy to deduce that there are indeed measures need to be put in place to invigorate the sector.

Some may argue, however, on the reliability of the estimates in the national accounts but it should also be realized that estimates is dependent on the quality of information from data sources. It is for this reason that utmost cooperation and support from the public and private data providers, government units, and other stakeholders are sought.

Moreover, the regular generation of a Supply and Use Table (SUT) is necessary to address data gaps in the estimation of BSOD. This is a powerful tool to check the consistency of statistics in the principle that total supply of goods and services equals total use of goods and services. Utilizing this technique will help us explain some situations in the agriculture sector. Investments i.e., cultivated assets are indicators of future production particularly in agriculture, hence, it is necessary to improve the methodology in measuring BSOD in the PSNA.

Lastly, the following are some of the recommendations to improve the estimation of investments covered under BSOD:

- Data support for the estimation of agricultural investments must be strengthened.

Additional indicators should be compiled and published on a regular basis; namely, area for newly planted permanent crops, cost of investments for major permanent crops, and prices for breeding of animals. There should also be a central unit responsible for the inventory data of animals submitted by respective groups or associations. Conduct of the review and harmonization of the agricultural censuses and surveys and other data gathering activities is necessary. Regular discussions and consultations with data providers should be undertaken.

- Relevance of cultivated biological resources in the national accounts must be promoted.

  There be lack of information on this aspect of national accounting covering investments on animals and permanent crops and concerned data compilers may not even know of it being captured. BSOD estimates should be aligned with government plans and strategies towards strengthening the agricultural sector and achieving national food security.

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Department of Agriculture. 2017-2022 *Philippine Coffee Industry Roadmap*.

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ANNEX A

Field visit sample questionnaire

Field Visit to Selected Cacao Farm Establishments for the Updating of Breeding Stocks and Orchard Development (BSOD) Indicators, Parameters and Methodology

Province Name	
Municipality	
Barangay	
Establishment	
Name of Respondent	
Date of Visit	

Screening questions:

A. When did you last plant the most number of cacao trees? _____

B. How many seedlings have you planted that year? _____

C. Survival Rate for cacao trees planted:
Year 1 _____ Year 2 _____ Year 3 _____ Year 4 _____ Year 5 _____

D. Estimated number of newly planted seedlings: per year _____ per quarter _____

E. Estimated distance between seedlings planted _____

The items in the tables below refer to the parcel with cacao trees and the costs incurred before the trees start to yield products.

Items	Data	Remarks
1. Land area planted *No. of hectares of the parcel planted with cacao trees, as of Year 1 (refer to Screening Question A).*		

2. Estimated number of trees planted per hectare *Estimated number of trees per hectare, as of time of interview.*		
Items	**Data**	**Remarks**
3. Estimated number of years before the trees yields products. *The number of years before the trees first bears fruits.*		
4. Estimated number of years before the the trees end their service lives (becomes unproductive). *The period when the trees no longer produce fruits.*		

**Year 1 refers to the answer in Screening Question A. Years 2 to 5 are the consecutive years after Year 1.*

Items	**Year**					**Remarks**
	1 ___	**2** ____	**3** ___	**4** ___	**5** ___	
5. Estimated costs incurred on the following items, before the trees start to yield products						
a. Seedlings						

Items	Year					Remarks
	1 ___	2 ____	3 ___	4 ___	5 ___	
i. Cost of seedlings *Estimated cost of seedlings paid as of Year 1; if self-produced, impute the price using the prevailing price of seedlings.*						
ii. Transport cost of seedlings *Cost of transporting the seedlings.*						
iii. **Other expenses related to seedlings** *Other expenses associated with seedlings*						
b. Land preparation						
i. Labor cost for land clearing (*Kaingin*) *Labor cost for clearing, as preparatory activity for planting*						

Items	Year					Remarks
	1 ___	2 ____	3 ___	4 ___	5 ___	
ii. Cost for land cultivation *Labor cost for land cultivation/ digging of holes for planting)*						
c. Planting & Irrigation						
i. Labor cost for planting *Labor cost incurred for the planting of seedlings*						
ii.Irrigation/ water cost *Labor costs incurred in watering the seedlings/trees*						
d. Staking *(if applicable)*						
i. Cost of materials used in staking *Cost of sticks, posts and other materials used as support around the seedlings/ plant*						

Items	Year					Remarks
	1 ___	2 ____	3 ___	4 ___	5 ___	
ii. Labor cost on staking *Labor cost on staking (putting sticks or posts around the seedlings/plant as support)*						
e. Protection from the weather/ stray animals						
i**. Cost of materials** *Cost of materials used in building up protection (such as fence) against stray animals/ weather*						
ii. Labor cost *Labor cost in building up protection (such as fence) against stray animals/ weather*						
f. Fertilizers						
i. Cost of fertilizers used						
ii. Amount of fertilizers applied						

Items	Year					Remarks
	1 ___	2 ____	3 ___	4 ___	5 ___	
iii. Labor cost on the application of fertilizers						
g. Pesticides						
i. Cost of pesticides used						
ii. Amount of pesticides applied						
iii. Labor cost on pesticide management						
h. Pruning *(if applicable)*						
i. Cost of materials used for pruning						
ii. Labor cost on pruning						
I. Weed control *(if applicable)*						
i. Cost of herbicide/ materials used						

Items	Year					Remarks
	1 ___	2 ____	3 ___	4 ___	5 ___	
ii. Amount of herbicide applied (in case of weed control using herbicide)						
iii. Labor cost on the application of herbicides/ manual weeding						
j. Other costs of materials *Other costs incurred for materials not classified elsewhere*						
k. Other labor cost *Other costs incurred for labor not classified elsewhere*						