



# Cambodia's Agriculture Productivity: Challenges and Policy Direction



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## EXECUTIVE SUMMARY

Cambodia has made remarkable achievement to sustain robust economic growth with the average rate of 7.7% over the last two decades; thanks to political and macroeconomic stability which incrementally built up investors' confidence. Agriculture was considered as one of important sectors not only contributing to economic growth. Remarkably, during 2004-2013, agriculture demonstrated very promising growth rate 5% per annum, mainly attributed to strong agriculture commodity prices at the regional and global market, introduction of new technology, favorable weather condition, improved regional integration, and rapid land expansion. The significant growth of agriculture contributed to economic growth, poverty reduction, food security and job creation. For instance, during 2004-2013, agriculture contributed almost 1% to the average annual economic growth of 6.5%. In addition, during this corresponding period, agriculture demonstrated its tremendous contribution around 60% to poverty reduction from 50% in 2007 to 21% in 2011 and continued to attribute around 44.7% to poverty reduction from 18.9% in 2012 to 9.4% in 2017. However, over the last five years (2014-2018), agriculture sector showed very much decelerating growth with the annual rate of 1.0% mainly attributed to the negative impact of extreme weather condition such as flood and drought, drop of agriculture commodity prices, and slowdown of agriculture productivity under the constraint of limited expansion of cultivated area. All types of agriculture productivity including land productivity, labor productivity and total factor productivity of agriculture showed very much decelerating trend. This has been caused by the combination of many factors ranging from lack of investment in Research and Development in good quality seeds, limited access to water despite remarkable increase of investment in irrigation scheme, limited farming technique, inefficient agriculture input utilization, inefficient mechanization, lower human capital, lack of diversification and other critical related factors. Boosting agriculture productivity—land, labor and total factor productivity (TFP) is the key to drive agriculture growth in the medium term and long term by addressing aforementioned issues. The findings showed that if Cambodia could boost agriculture TFP growth at 6.0% per annum, assuming the agriculture inputs remain constant, agriculture sector would be projected to grow around 2.9% per annum during 2019-2030. Under the scenario that both agriculture inputs are increased by only 1.0% per annum and TFP of agriculture sector is increased by 6% per annum, the agriculture is projected to enjoy the strong growth of 4.2% per annum during 2019-2030. The simulation came up with the assumption that other uncontrollable factors remain constant.

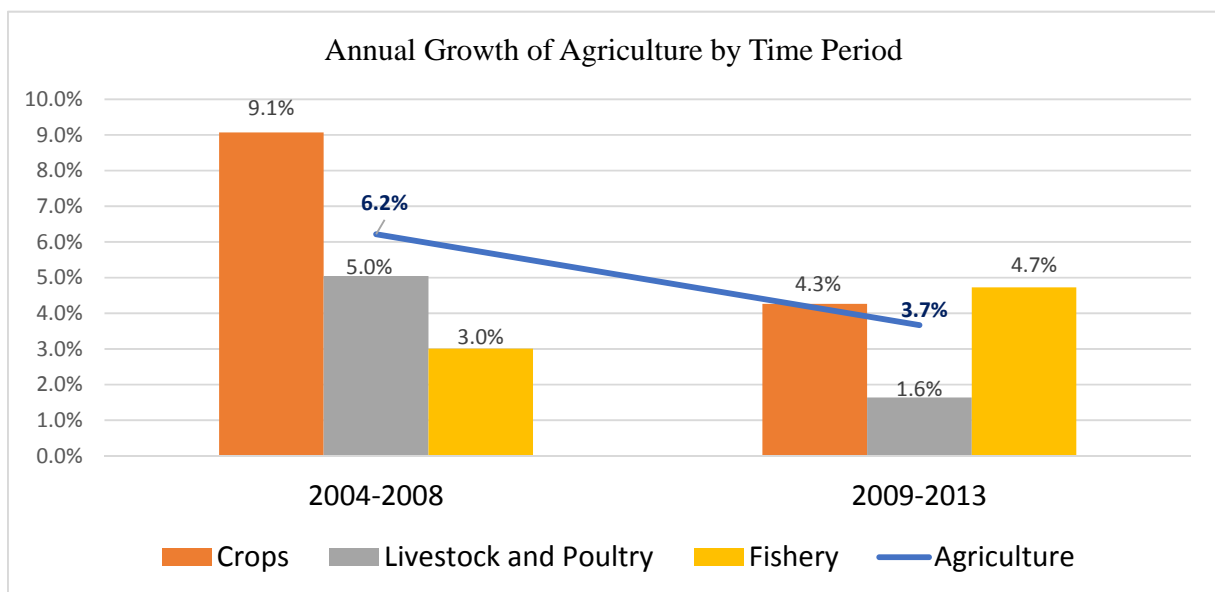
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## 1. Introduction

### 1.1. Development of Cambodia's Agriculture Sector in Brief

Cambodia has achieved robust economic growth with the average rate of 7.7% per annum over the last two decades. This remarkable achievement has resulted from the government's effort in collaboration with development partners to maintain sound macroeconomic and political stability, which created conducive business environment for both domestic and international investors. Agriculture was noted as one of the major sectors, which enjoyed very strong growth. The sector showed very strong growth with the average rate of 6.2% per annum during 2004-2008 and 3.7% per annum during 2009-2013, mainly attributed to rapid expansion of cultivated area, strong agriculture commodity prices at the regional and global market, improved regional integration which was conducive for cross border trade, and introduction of new technology by both government agencies, development partners and other stakeholders working the area of agriculture, according to the findings of World Bank's study about Cambodia's Agriculture in Transition: Risk and Opportunities in 2015.

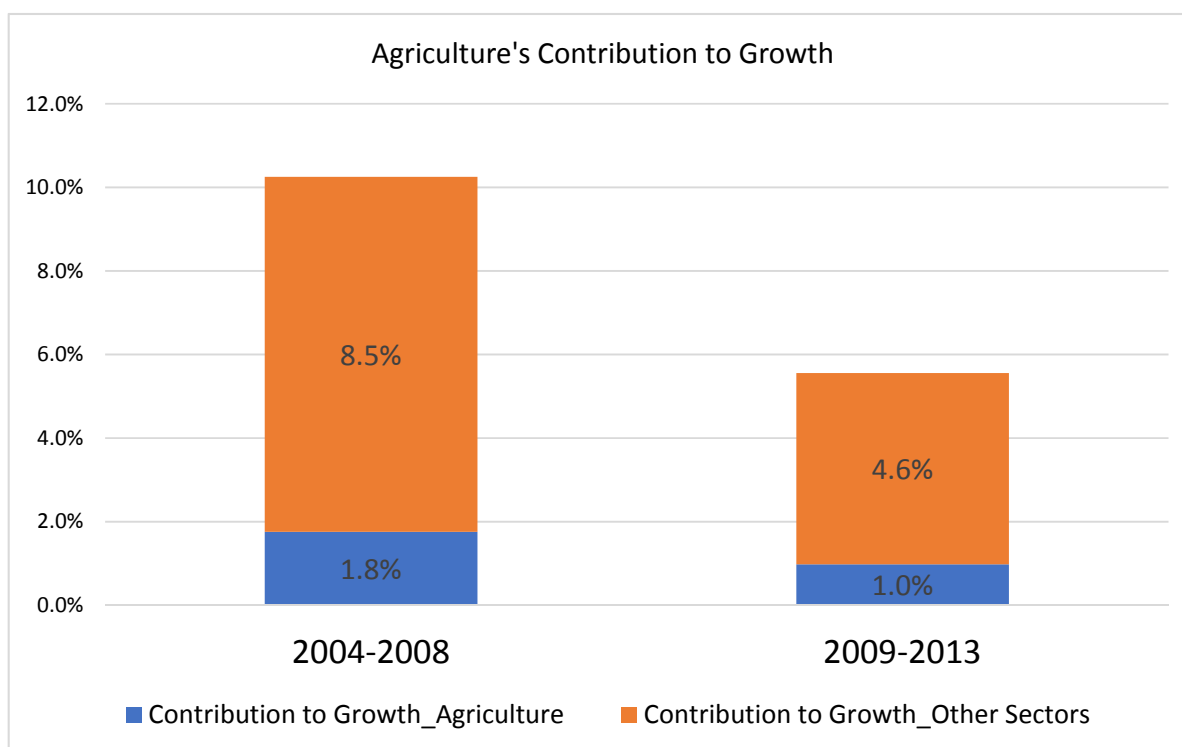
**Figure1: Annual Growth of Agriculture**



**Source: NIS**

Robust growth of agriculture during 2004-2013 tremendously contributed to overall economic growth. Evidently, when Cambodia achieved the strong economic growth with the average rate of 10.3% during 2004-2008, agriculture contributed 1.8% and it continued to significantly contribute by 1.0% to the overall economic growth rate of 4.6% during 2009-2013. (See Figure2).

**Figure2: Agriculture's Contribution to Growth**



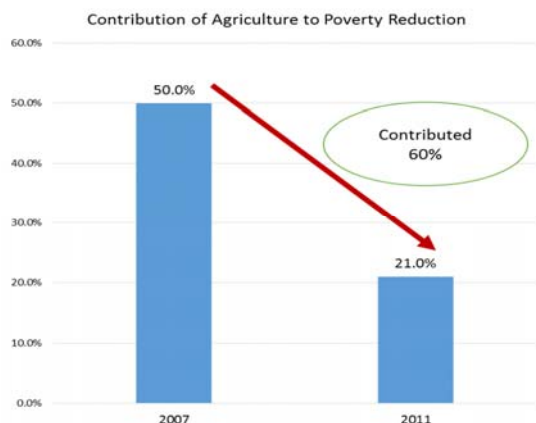
Source: NIS

In addition, the remarkable development of agriculture in the corresponding period also significantly contributed to poverty reduction. According to the World Bank's Study "Cambodia's Agriculture in Transition: Risk and Opportunity, agriculture contributed around 60% of poverty reduction from 50% in 2007 to 21% in 2011 and it continued to do so by 44.7% to poverty reduction from 18.9% in 2012 to 9.4% in 2017<sup>1</sup> (See Figure3).

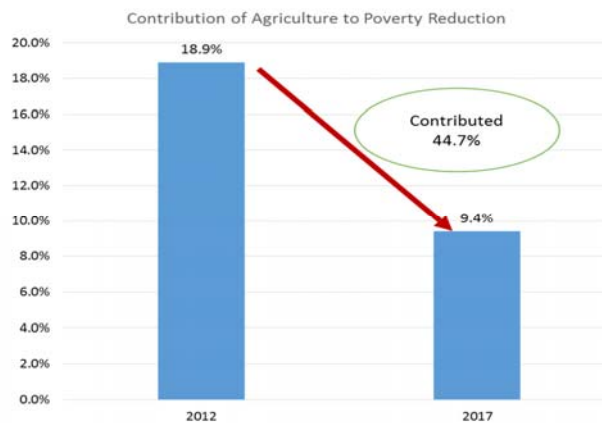
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<sup>1</sup> Estimate based on CSES

**Figure3: Agriculture’s Contribution to Poverty Reduction**



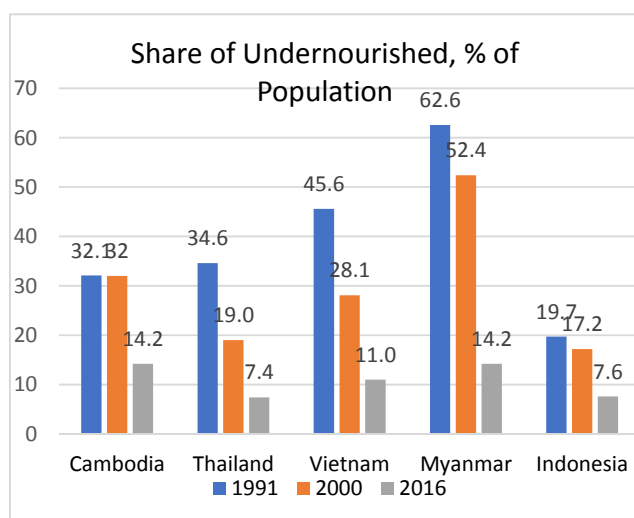
Source: World Bank



Source: Estimate based on CSES

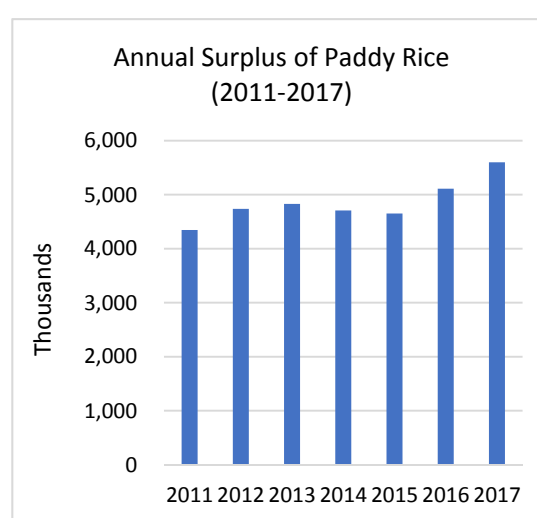
Moreover, the development of agriculture sector robustly contributed to improvement of food security, reflected by the shift from food importing country to self-sufficient food and yielding the surplus for export, especially the growing export of milled rice and paddy rice. In addition, the enhanced food security was also explained by the drop of undernourished as percentage of population—from 32% in 2000 to 14.2% in 2016 even though this number was still higher than that of other peer countries’—Thailand from 19% to 7.4%, Vietnam from 28.1% to 11.0%, and Indonesia from 17.2% to 7.6% (See Figure4).

**Figure4: Share of Undernourished to Population**



Source: FAO

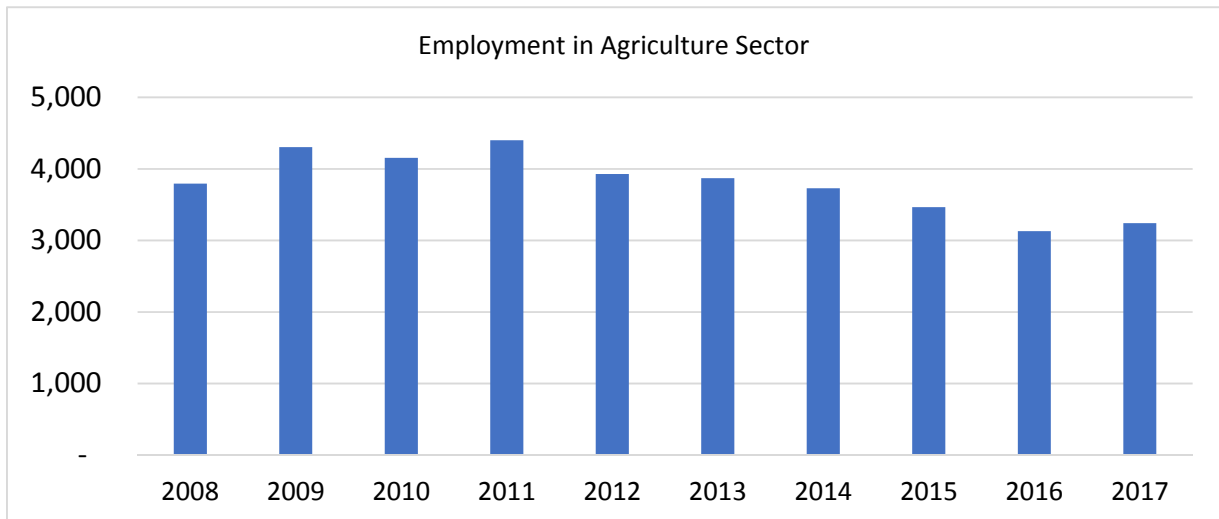
**Figure5: Paddy Rice Surplus**



Source: MAFF

With the strong growth of other sectors, encouraging people in the rural area to move out from agriculture sector, it has been noticed that the number of active labor force in agriculture sector remains big—ranging between 3 million and 4 million during 2008-2017. Against this backdrop, the agriculture remains significant to provide employment to existing labor forces and absorb new ones.

**Figure6: Employment in Agriculture Sector**



Source: CSES

### 1.2. Motivation of Study

After enjoying the remarkable growth during 2004-2013, which significantly contributed to socio-economic development aforementioned, the sector experienced much decelerating growth over the last five years (2014-2018). Despite its slowdown and less significance to overall economic growth over the last five years, agriculture has been still considered as one of the prioritized sectors by the government and development partners given existing natural endowment, big share of labor forces in agriculture sector, and remaining huge potential to be further leveraged which could contribute to diversify the sources of growth in the medium and long term. Transformation and accelerating the agriculture growth helps not only support the development of this sector itself, but also create the stronger backward linkage to other potential sectors such as agro processing, light manufacturing, tourism, retail etc. The Royal Government of Cambodia has always regarded enhancement of agriculture productivity as the key priority to boost agriculture growth and development. In order to achieve this objective, the government in collaboration with development partners has injected huge amount of money on development of both soft and hard infrastructure, agriculture extension services



and other related priorities. Despite intensive effort and resources allocated to support the objectives and goals over the last decade, growth of agriculture sector remains lagging behind—mainly attributed to reportedly stagnant growth of agriculture productivity. Recently, the government has launched the Rectangular Strategy-Phase4 (RS4) and National Strategic Development Plan (NSDP: 2019-2023), by which promoting agriculture development is the key priority, by which enhancing productivity, quality, and diversification is on the top. Given the tendency of slowdown of agriculture and the significance of agriculture productivity growth to address this critical challenge, it is so imperative that the study of Cambodia's Agriculture Productivity: Challenges and Policy Direction is conducted. The result from this study would provide very concrete policy direction to stakeholders, especially government agencies and development partners to have the roadmap of boosting agriculture productivity in the sustainably environmental manner.

## **2. Objectives, Analytical Framework and Literature Review**

### **2.1. Research Objectives**

The study of **“Cambodia's Agriculture Productivity: Challenges and Policy Direction”** is conducted to meet following objectives:

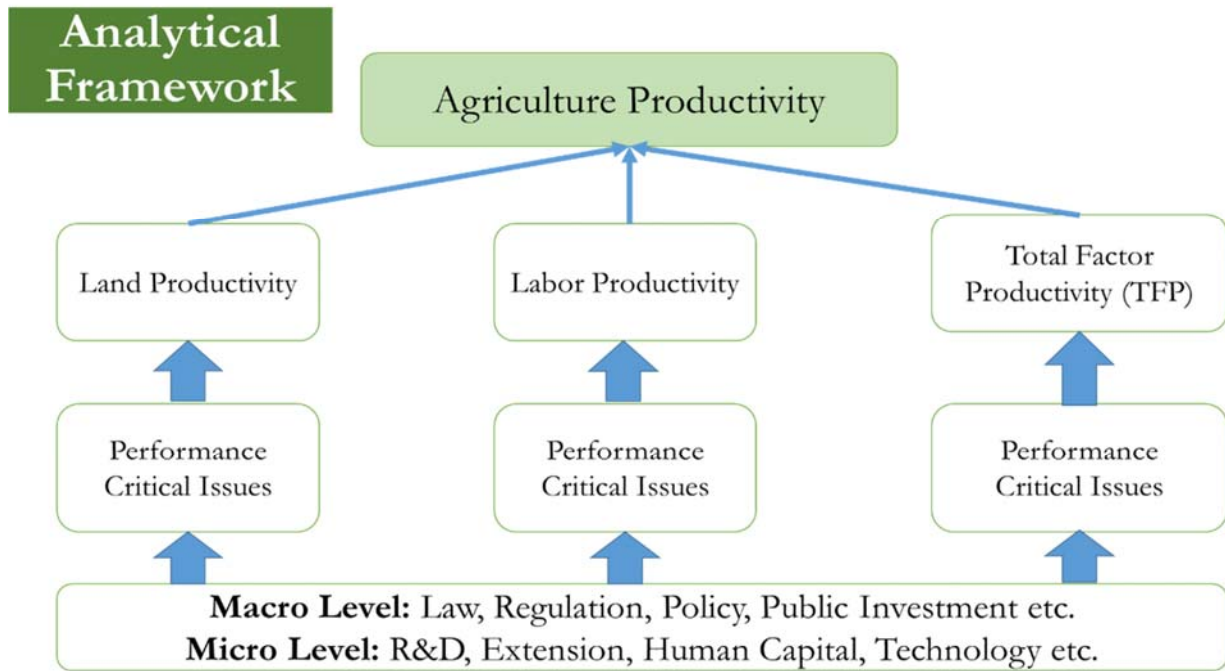
- (1) To assess the current status of agriculture productivity growth including the growth of total factor productivity, land productivity and labor productivity in agriculture;
- (2) To identify the critical challenges affecting the weak performance of agriculture productivity growth
- (3) To provide policy recommendations aimed at accelerating the growth of agriculture productivity—land productivity, labor productivity and total factor productivity in Cambodia's agriculture.

### **2.2. Analytical Framework**

The study of **“Cambodia's Agriculture Productivity: Challenges and Policy Direction”** is conducted by applying the below analytical framework, where agriculture productivity is the key variable which depends on the combination of land productivity, labor productivity, and total factor productivity growth. Under this study, the researcher assess the current status or performance of the growth of land productivity, labor productivity and total factor productivity. In addition, critical challenges which affect the growth of respective productivity parameter are also discussed in this study. In addition, the relevant parameters linking directly and indirectly to agriculture productivity

such as law, regulation, public investment, R&D, extension services, human capital and technologies are also incorporated in this analytical framework (See Figure7).

**Figure7: Analytical Framework**



### 2.3.Data Collection

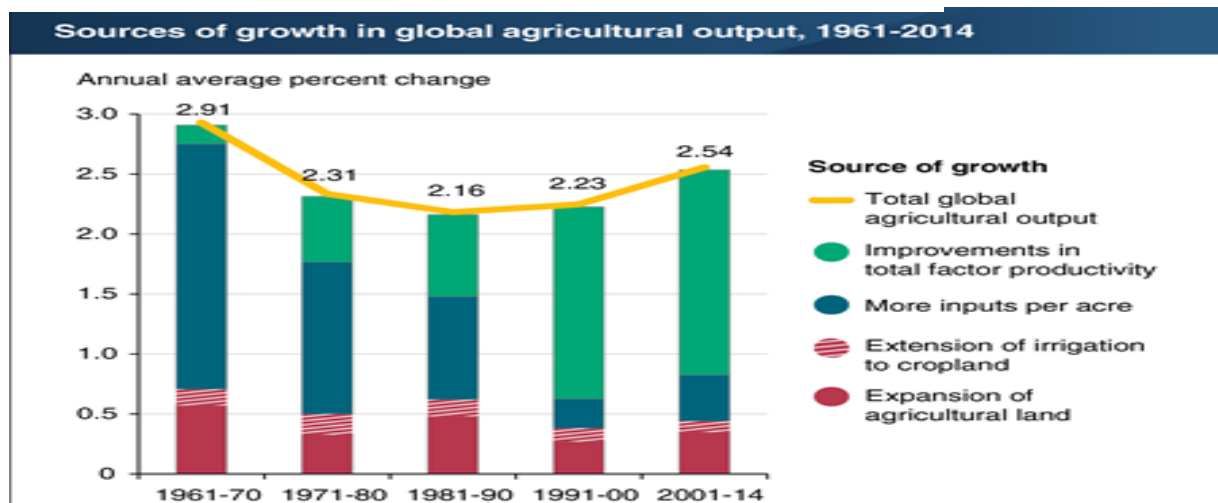
To proceed the study, researcher collects both primary and secondary data. Secondary data are collected by doing desk review of various publications, articles, journals and reports done by both government agencies and development partners as well as regional and international research institutions. For primary data, the researcher conducted field survey with farmers, agriculture cooperatives, and provincial department of agriculture, forestry and fishery (PDAFF) in major provinces such as Battambang, Pursat, Siem Reap, Kampong Thom, Pursat, Kandal, and Kratie. The researcher also does consultation with stakeholders at the national levels including the Ministry of Agriculture, Forestry and Fishery (MAFF), selected development partners such as World Bank, IFAD, ADB, FAO, UNDP, AFD, and other NGOs and local research institutes working in the field of agriculture. Tools and technique of primary data collection include semi-structure interview, Focused Group Discussion, and field survey. As it is the study at the macro level, quantitative data are mostly collected from existing sources as mentioned above while qualitative information is collected.

## 2.4. Literature Review

### 2.4.1. Concept of Agriculture Productivity and Its Significance for Growth

Conventionally, there are three approaches to boost agriculture growth—(1) increasing agriculture inputs, (2) boosting agriculture productivity, and (3) promoting the combination of both. Among these three approaches, agriculture productivity has been observed to have huge room to further improve. Global experience clearly showed that agriculture productivity, specifically total factor productivity was the driver of agriculture growth with the average rate of 2.4% per annum over the past 2 decades (1991-2014), followed by the expansion of agriculture land and increase of agriculture inputs (See Figure8).

**Figure8: Sources of growth in global agricultural output**



Source: USDA

Basically, agricultural productivity is measured as the ratio of agricultural outputs to agricultural inputs. Agriculture outputs could be in value—such as revenue or income generated from agriculture production or volume in metric ton. Agriculture inputs include land, labor, seeds, fertilizer, livestock and poultry, pesticides, feeds, machinery etc. Land Productivity: Measures of land productivity—partial factor productivity (PFP) measures—are calculated as the ratio of total output to total agricultural area. Labor Productivity: Measures of labor productivity—partial factor productivity (PFP) measures—are calculated as the ratio of total output to the number of economically active persons in agriculture. TFP is an indicator of how efficiently agricultural land, labor, capital, and materials (agricultural inputs) are used to produce a country's crops and livestock (agricultural output). It is calculated as the ratio of total agricultural output to total production inputs.

## 2.4.2. Factors Affecting Agriculture Productivity

According to FAO, there are fundamental factors affecting agriculture productivity including human capital, agriculture research and technology transfer, public investment and policy, and political stability and conflict.

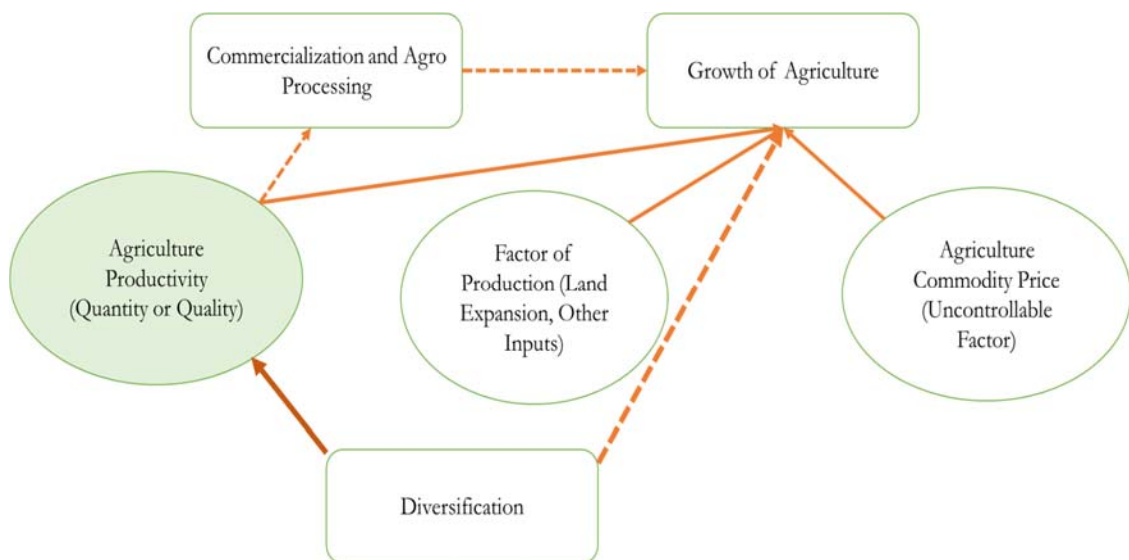
- (1) **Human Capital:** Human capital directly influences agricultural productivity by affecting the way in which inputs are used and combined by farmers. Improvements in human capital affect acquisition, assimilation and implementation of information and technology. Human capital also affects one's ability to adapt technology to a particular situation or to changing needs.
- (2) **Agriculture Research and Technology Transfer:** research increases the set of available technologies, hence agricultural R&D expenditures are used as a proxy for agricultural technological change. However, the development of technology does not always result in its adoption. In some cases this may be because the technology being developed is not appropriate, that is, it does not meet the needs of agricultural producers.
- (3) **Public Investment and Policy:** Public policy and budgetary decisions regarding infrastructure also have a profound effect on agricultural production. The financing aspects of public R&D and human capital development were discussed above, but both physical and institutional infrastructure affect the development and transfer of technology. For example, irrigation systems and roads may be required to make a technology profitable to implement.
- (4) **Political Stability and Conflict:** Another aspect of policy that can influence or hinder agricultural production is the political situation. In a study of the productivity growth of 83 industrial and developing countries between 1960 and 1990, Nehru and Dhareshwar (1994) found that the economies that perform the worst are those involved in wars (particularly civil wars) and those that have the most price distorting policies. They explore a variety of policy variables and find that apart from political stability and

the initial endowments of a county, virtually no other policy variable is associated with growth.

### 2.4.3. Inter-Linkage Between Agriculture Productivity and Growth

Agriculture productivity not only contributes to accelerate the output growth of agriculture sector, but also promotes commercialization and agro processing in the sense that farmers could commercialize their agriculture produce with the competitive price when they could increase production yield or farming income with the same level of agriculture inputs. Resulting from increased commercialization and processing, the growth of agriculture sector would be accelerated. On the other hand, agriculture productivity has been driven by the level of diversification—either with sub-sectors let say from low value rice to premium rice or from rice to vegetables or other potential commodities with higher profit margin, or cross-subsectors—from crops to livestock and poultry, or aquaculture (See Figure9)

**Figure9: Inter-Linkage between Growth, Productivity, Commercialization and Diversification**



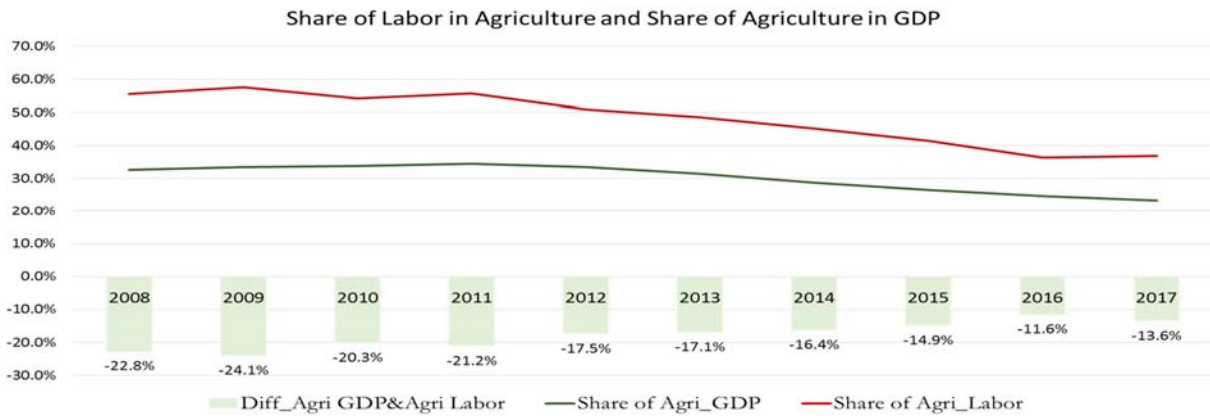
## 3. Discussion of Findings

### 3.1. Structural Transformation of Agriculture Sector

Agriculture sector demonstrated very remarkable structural transformation over the last 10 years. This tendency has been reflected by the narrowed gap between the share of labor forces in agriculture sector and share of agriculture in GDP. Evidently, in 2008, the gap between share of labor forces in agriculture and share of agriculture in GDP was up to 22.8%. However, in 2017, the gap dropped to

13.6%. This indicated that there was the movement of labor force from agriculture sector to other sectors such as industry and services with higher value add. The figure also explained that labor working in agriculture was more productive even though the pace of labor productivity growth remained low if compared to other countries’.

**Figure10: Structural Transformation**

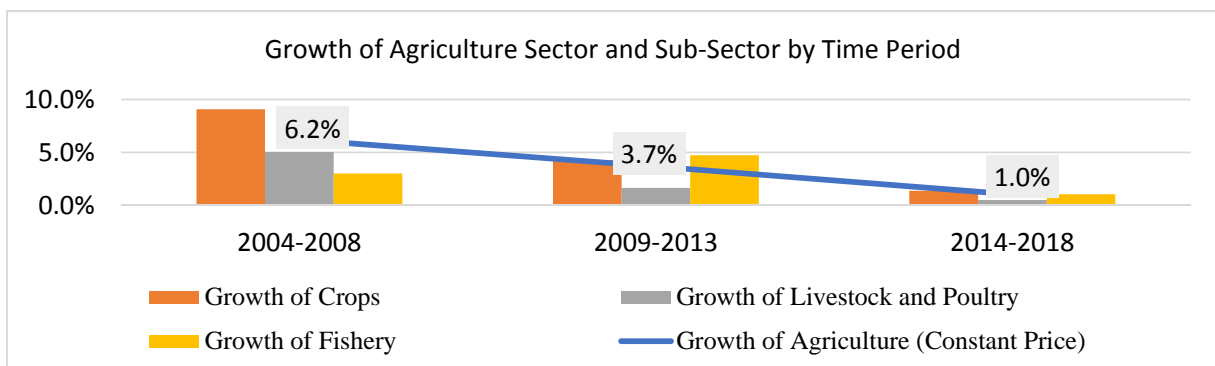


Source: NIS and CSES

### 3.2. Agriculture Growth

After enjoying the remarkable growth with the average rate of 3.7% during 2009-2013 and 6.2% during 2004-2008, agriculture sector showed very much decelerating growth to around 1.0% during 2014-2018. In the corresponding period, crops, fishery and livestock and poultry experienced much slower growth to around 1.0%, 1.0% and 0.5% from 4.3%, 4.7% and 1.6% per annum during 2009-2013 respectively. The moderating growth of agriculture has caused its share to gross domestic product (GDP) to decline from around 30% in 2004 to only 22.2% in 2018.

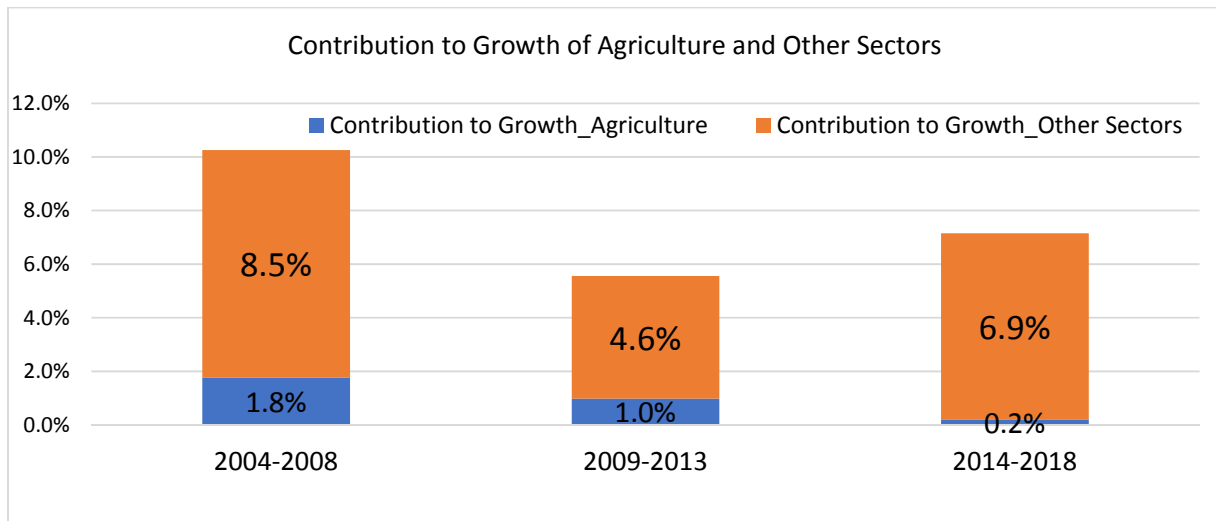
**Figure11: Growth and Share of Agriculture Sector**



Sources: NIS

In addition, much decelerating growth of agriculture sector over the last five years has resulted in the reduction of its contribution to growth to only 0.2% to the average growth rate of 7.1% during 2014-2018, down from 1.8% to the annual growth rate of 10.3% during 2004-2008, 1.0% of GDP growth of 5.6% during 2009-2013 (See Figure12).

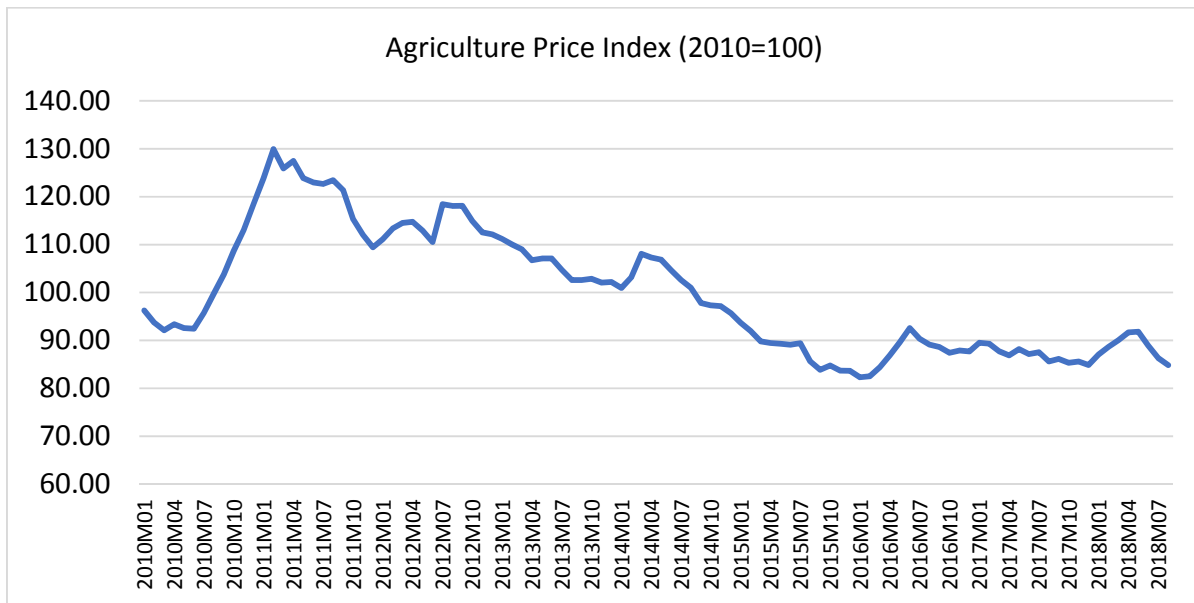
**Figure12: Contribution to Growth**



Source: NIS

Slower growth of agriculture sector during 2014-2018 was attributed to (1) Drop of agriculture commodities' prices, (2) Extreme weather events, (3) Decelerating growth of agriculture productivity—land, labor and total factor productivity (TFP) of agriculture sector when the sector has been facing the constraints of limited land expansion. The graph in **Figure13** clearly demonstrated that over the last several years, agriculture price index constantly dropped mainly caused by the increase of supplies and policy changes of the government in some countries. In addition, the stagnant growth of agriculture sector of around 1.0% per annum was also caused by flood and drought, caused by extreme weather condition such as Elnino or Lalina. According to assessment done by National Committee for Disaster Management (NCDM) and Asian Development Bank (ADB), economic loss and damage caused by flood was around USD 356 million in 2013 and economic loss and damage caused by drought (El Niño) was USD 1,500 million in 2015. Agriculture was the most severely affected sector.

**Figure13: Agriculture Price Index**



Source: World Bank

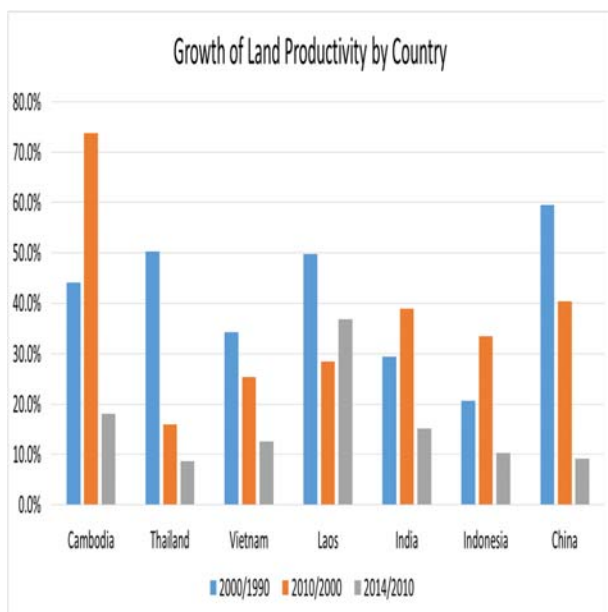
Drop of agriculture commodity prices and extreme weather events were the regional and global risks which were materialized and negatively affected almost all countries in the region. However, as described in above sections, during 2014-2018, most countries in the region showed strong growth of agriculture sector, driven by the improved agriculture productivity, but Cambodia did not share this trend. Decelerating growth of land productivity, labor productivity and total factor productivity of agriculture were the key indicators to explain the

### 3.3.Land Productivity Growth: Current Status and Challenges

Land productivity growth of Cambodia was much decelerating during 2014-2018 and it was estimated to continue this trend up to 2018. The graph in **Figure14** showed that the growth rate of land productivity dropped from 73.8% in 2010 compared to 2000 to 18% in 2014 compared to 2010. Other countries also shared this trend, but the magnitude of growth rate drop was relatively smaller than that of Cambodia. Decelerating growth of land productivity of Cambodia was reflected by the slower annual growth of paddy rice production yield and rubber production yield—from 2.9% and 0.2% during 2009-2013 to 1.2% and 0.1% during 2014-2018 respectively.

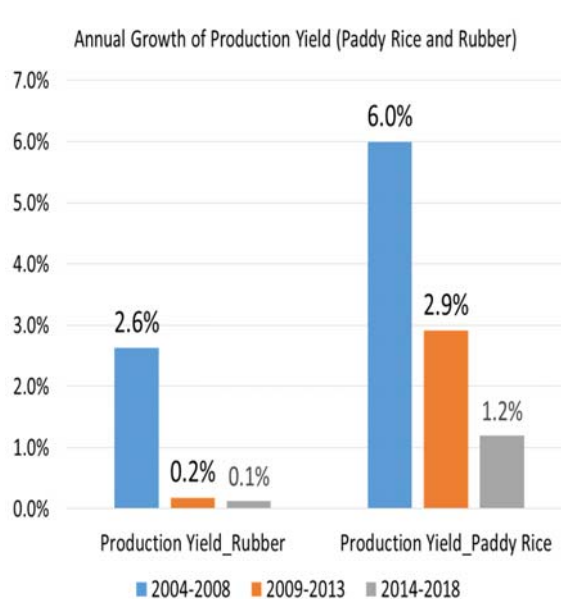


**Figure14: Growth of Land Productivity**



Source: GFPR 2018

**Figure15: Annual Growth of Production Yield**



Source: MAFF

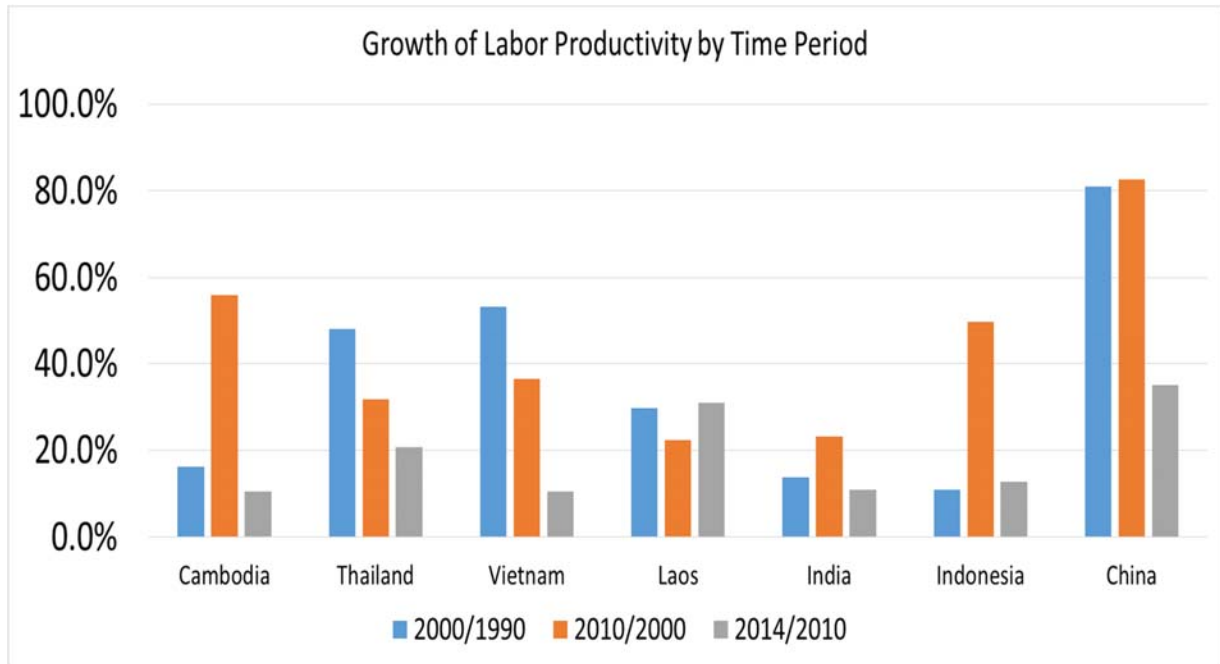
According to field consultation with stakeholders, much decelerating growth of land productivity was attributed to (1) degradation of land quality, improper land use which is linked to farming technique, and small scale of land which negatively affects the efficiency of farming, (2) limited access to water despite remarkable investment in irrigation scheme, (3) inefficiency of labor in utilizing agriculture inputs such as sowing seeds, applying fertilizer, spraying pesticides, and cutting crops, etc. and (4) low quality of utilized agriculture inputs. On the top of those four main factors, lack of public investment in research and development (R&D)—less than 1% of the total public spending basket would be the critical factor to negatively affect the growth of land productivity.

### 3.4.Labor Productivity Growth: Current Status and Challenges

In addition, Cambodia also experienced much slower growth of labor productivity. The graph in **Figure16** showed that the growth rate of labor productivity dropped from 55.8% in 2010 compared to 2000 to 10.4% in 2014 compared to 2010. Other countries also shared this trend, but the magnitude of growth rate drop was relatively smaller than that of Cambodia. Decelerating growth of labor productivity was attributed to four main factors including (1) share of public spending in extension services was relatively low—round 5.8% of total basket, (2) ineffectiveness of delivering extension services to farmers owing to inconsistency and difference of information and messages provided by

various actors, (3) agriculture extension service was supply driven, rather than demand driven; and (4) lower degree of human capital of Cambodian people, especially farmers with lower level of education. According to World Bank, human capital index (HCI) of Cambodia was 0.49, lower than Thailand, Vietnam and Indonesia with the HCI of 0.60, 0.66 and 0.53 respectively.

**Figure16: Growth of Labor Productivity by Time Period**

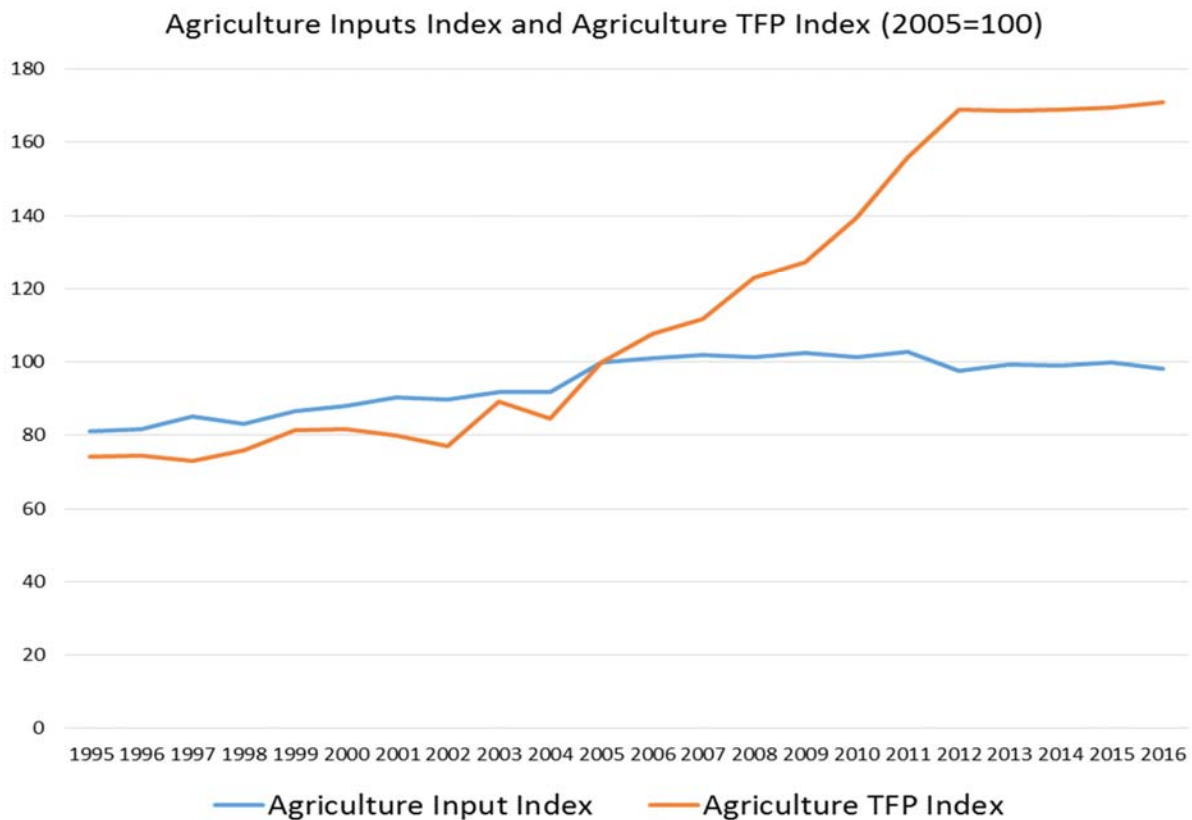


Source: GFPR 2018

### 3.5. Total Factor Productivity Growth: Current Status and Challenges

The growth of agriculture sector is conventionally determined by the growth of TFP and growth of agriculture inputs. Over the last five years, both agriculture inputs index and agriculture TFP index were relatively constant. This tendency explains the slower growth agriculture over the last five years **(See Figure17)**. By definition, Agriculture Total Factor Productivity (TFP) refers to the degree of efficiency of utilizing agriculture inputs and application of method of production. Agriculture inputs include land, labor, livestock capital, machinery capital, fertilizer, and feed. Agriculture total factor productivity (TFP) refers to the degree of efficiency of utilizing agriculture inputs.

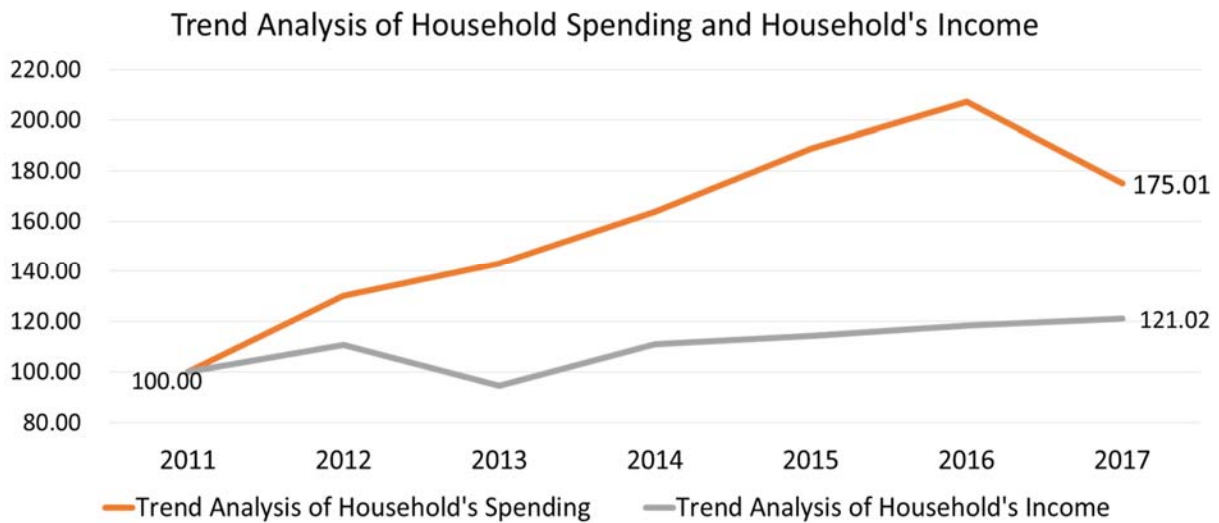
Figure17: Agriculture Inputs Index and TFP Index



Source: USDA, Economic Research Services Office

Near zero growth of agriculture total factor productivity has been caused by (1) Inefficiency of agriculture mechanization resulting in loss during post-harvest up to 150 kg to 200 kg per hectare per annum which was equivalent to around USD 300 million per annum, (2) Inappropriate use of agriculture inputs especially fertilizer, seeds and pesticides making farmers to bear with higher production cost and (3) Lack of agriculture diversification by which the sector remained heavily depending on crops, especially rice while other potential sub-sectors have been still lagging behind. Data extracted from CSES showed that during 2011-2017, the gap between household's spending in and household's income generated from agriculture sector was widening, which reflected to rising inefficiency of agriculture farming (See Figure18).

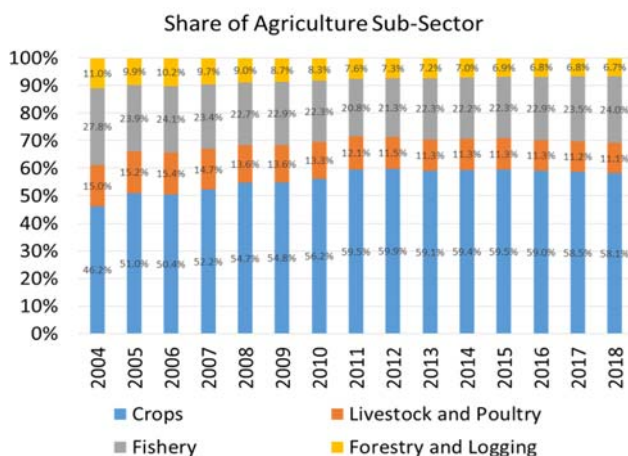
Figure18: Trend of Household's Spending and Income



Source: CSES

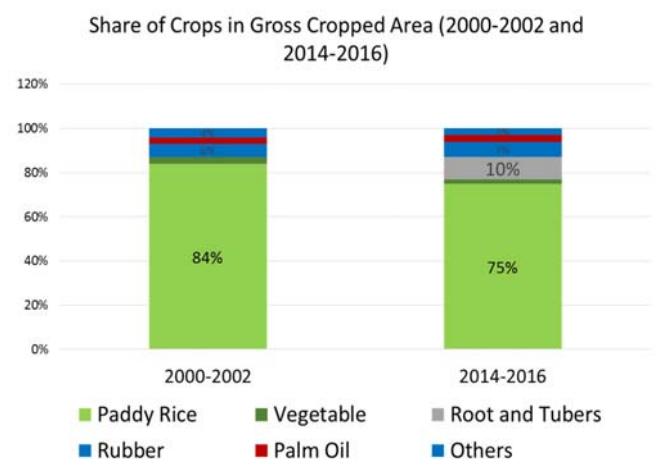
The pace of agriculture diversification remained slow despite some noted progress over the last decades. The graph below indicated that crops still constituted the largest share in agriculture sector—ranging between 55% and 58% while the other potential sub-sector such as livestock and poultry, and fishery constituted the small shares of around 11% and 22% respectively. Disaggregated crops by small sectors, the area of paddy rice production was shared of 75% during 2014-2016 while other combined small sub-sectors of crops shared only 25%.

Figure19: Share of Agriculture by Sub-Sector



Source: NIS

Figure20: Share of Crops in Cropped Area

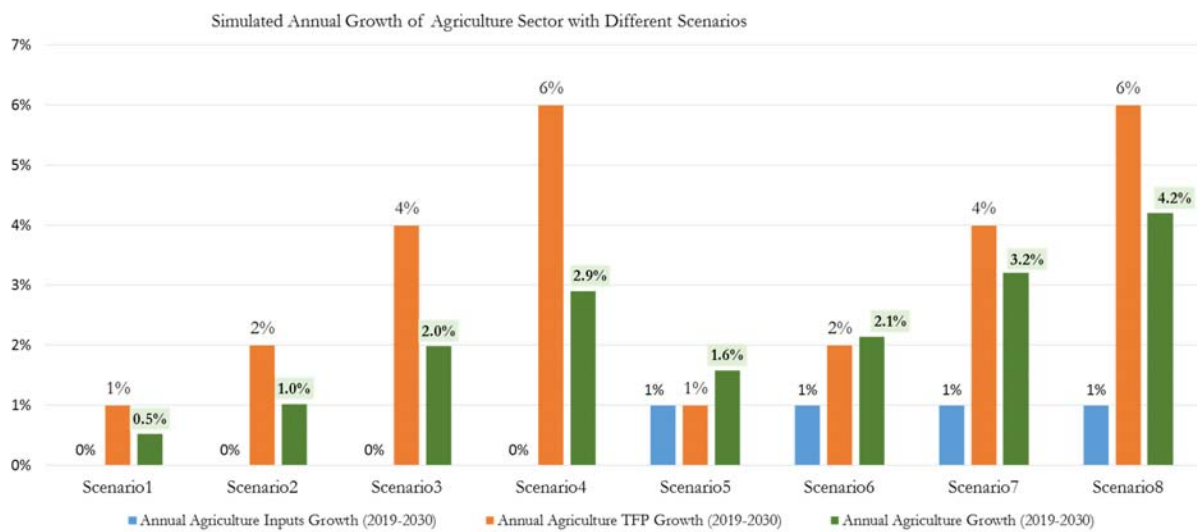


Source: IFPR

By applying data of agriculture input index and total factor productivity index under the database of Economic Research Service Office of USDA, the annual agriculture growth could be calibrated under eight scenarios. **Scenario1-4:** assumed that there is no change of agriculture inputs index, but

agriculture total factor productivity index changes by 1%, 2%, 4% and 6%, then agriculture sector could grow 0.5%, 1.0%, 2.0% and 2.9% per annum respectively during 2019-2030. **Scenario5-8:** assumed that the agriculture inputs index grow by 1.0% per annum and total factor productivity of agriculture index grows by 1.0%, 2%, 4%, and 6%, then agriculture sector grow 1.5%, 2.1%, 3.2% and 4.2% respectively during 2019-2030.

**Figure21: Simulated Annual Growth of Agriculture**



Source: Simulated by Researcher by Utilizing Data from USDA, Economic Research Services Office

#### 4. Conclusion and Policy Recommendations

Under the constraints of limited land expansion, concern about environmental sustainability, shortage of labor but rising labor cost, in order to boost agriculture growth in the medium and long term, increasing agriculture productivity—both quantitative and qualitative measure, is very critical. Given the aforementioned productivity gap, Cambodia has potential to increase productivity of agriculture sector, especially qualitative measures. The opportunities of boosting qualitative productivity could be reflected by rising demand of safe and quality food, expected natural land consolidation, and rapid development of technology that Cambodia could leverage. Agriculture productivity could be enhanced through **A. Improving land productivity** through (1) Rationalizing and harmonizing irrigation schemes, (2) Improving land quality, enforcing land zoning, and natural consolidation of land, (3) Further investing in Research and Development in good quality seeds and supply in the affordable manner, and (4) Enforcing agriculture input quality control, labor productivity, and total

factor productivity; **B. Enhancing labor productivity by** (1) Providing demand driven extension services through PPP approach, (2) Strategically focusing on relatively niche products with higher value add, (3) Promoting education and agro-entrepreneurship of farmers, (4) Unlocking the potential of technology and educate farmers to utilize it; **C. Accelerating total factor productivity of agriculture** through (1) Optimizing the use of agriculture inputs, (2) Increase efficiency of agriculture mechanization by providing capacity building training to machinery drivers, and (3) Promoting diversification of agriculture commodities and (4) Improving the infrastructure linkage and harmonization of planning and implementation

#### **A. Improve Land Productivity**

- (1) **Rationalize and harmonize irrigation schemes:** the investment in irrigation should be prioritized on small and medium scale rather than the large one. The key focuses of the irrigation scheme should be shifted from paddy rice to other potential crops especially vegetable and fruits. All investment project in irrigations financed by both government budget and development partners' budget should be designed and implemented in the harmonized and integrated manner to ensure the linkage and efficiency of spending. The Ministry of Water Resource and Meteorology (MOWRAM) and the Ministry of Agriculture, Forestry and Fishery (MAFF) should intensify the effort of collaboration during the design and implementation stage of irrigation projects.
- (2) **Improve land quality, enforce land zoning and natural consolidation of land:** upgrade land quality of all crops through doing land leveling and watershed management to prevent soil fertility erosion caused by eventual land slide from the mountain. In addition, it is also imperative that land zoning process is accelerated, get adopted and implemented based on the potential of agriculture commodities. Moreover, in order to increase land productivity, it is also important to leverage the natural land consolidation—by which non potential smallholder farmers could rent their land to medium or large scale or they could participate in agriculture cooperatives to increase efficiency of production.
- (3) **Further invest in R&D in good quality seeds and supply in the affordable manner:** further increase investment in research and development especially in climate resilient fragrant rice varieties, good quality seeds of other potential commodities such as mango, cassava, corn, fish and animal seeds. The investment should be done through public private partnership (PPP) approach and triple helix platform where government agencies, research institute [CARDI] or universities

and private sector could participate actively. Government should consider providing tax incentives or matching grants to targeted R&D projects—either exclusively serving the interest of private companies themselves or serving the whole public interest. Private sector could initiate the R&D based on market demand while research institutes (CARDI or Universities) should be strengthened financial and technical capacity to execute their research projects.

- (4) **Enforce the agriculture input quality control:** the government agency—the Ministry of Agriculture, Forestry, and Fishery (MAFF) should put additional effort to enforce the inspection of quality of agriculture input supplies—ranging from fertilizer, pesticides, seeds and feeds currently traded in the market. To implement this effectively, there should be the gradual decentralization of resources to provincial level and strengthening of technical capacity of officials and quality inspection laboratory facilities at the regional level. The proposed regions include: **Region1** (cluster of Battambang, Pursat, Banteay Meanchey and Pailin), **Region2** (cluster of Kampong Thom, Siem Reap, Preah Vihea and Oddar Meanchey), **Region3** (cluster of Kampong Cham, Thbong Khom, Prey Veng and Svay Rieng), **Region4** (Kratie, Thbong Khmum, Rattanak Kiri, Mundul Kiri, and Steung Treng), and **Region5** (Kampong Speu, Kampong Chhnang, Takeo, Kampot, Preah Sihanuk and Koh Kong).

## **B. Enhance Labour Productivity**

- (1) **Provide demand driven extension services through PPP approach:** promote market demand extension services—pre, during and post-harvest to farmers through PPP approach by which the government agency (the Ministry of Agriculture, Forestry and Fishery) conducts the research of modern and innovative farming technique, develop the harmonized extension services guideline for respective commodities, monitor and evaluate the agriculture extension services while the private sector or NGOs specializing in agriculture implement the extension services project outsourced by the government.
- (2) **Strategically focus on relatively niche product with higher value add:** given the constraint of resource endowment, especially limited land expansion and decline of labor in agriculture and stronger competition by peer countries such as Thailand and Vietnam on mass commodities, farmers should be well informed to choose strategic crops with higher value such as fragrant rice, vegetable with GAP, fruits, and other selected organic products. To do this, it is important to effectively enhance market linkages between private sector and farmers through contract farming platform.

- (3) **Promote basic education and agro-entrepreneurship of farmers:** build up the capacity of farmers through providing basic education—financial literacy, fundamental cost-benefit analysis, cash flow management, market information, effective farm management, marketing and management. Experiences showed that farmers with better education and agro entrepreneurship mindset could operate their agriculture business effectively.
- (4) **Unlock the potential of technology and educate farmers to utilize it:** encourage farmers to leverage the potential of rapid development of technology so that they could manage their farm through online application, do marketing and selling their product online.

### **C. Accelerate Agriculture Total Factor of Productivity (TFP)**

- (1) **Optimize the use of agriculture inputs:** promote efficiency of utilization of agriculture inputs such as fertilizer, seeds, pesticides, feeds and others in the appropriate manner, according to the technical standard requirement of respective commodity, which helps farmers to reduce the production cost and ultimately maximizing their profit.
- (2) **Increase efficiency of mechanization through training to machinery (tractors) drivers:** provide technical training to tractor or machinery drivers to do ploughing and harvesting properly and ethically to order to minimize the loss during harvest. According to survey conducted by MAFF, loss caused by improper use of mechanization (harvesting) is around USD 300 million per annum.
- (3) **Promote diversification of agriculture commodities:** encourage farmers to diversify the agriculture commodities from currently conventional ones especially white rice and low value add commodities toward higher value added ones. Diversification within crops subsector or toward other good quality agriculture commodities would enable farmers to maximize the benefit from utilizing their agriculture inputs. The experiences of other countries clearly demonstrated this positive correlation.
- (4) **Improve the infrastructure linkage and harmonization of planning and implementation:** increase the linkage of both supporting soft and hard infrastructure related to agriculture development at both national and sub-national level and further enhance the harmonization and integration of program, project and activities during designing and implementation stage. Specific focus on this could be the linkage between large irrigation scheme, small scheme, rural road, market place, logistics and transportation connectivity, integrated marketing platform etc.

[END]