

A Review of Emerging Trends and Patterns of Select Crops of Assam

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Abstract: Being a part of the Indian Subcontinent, Assam is predominantly an agrarian economy and has an excellent potential for growing food grains and non-food grains provided with propitious physiographic formations. More than 75 percent of the state's population rely either directly or indirectly on this sector who resides mainly in rural areas. Amongst all other food grains and non-food grains, rice, wheat, pulses, and edible oil are considered to be the staple and necessary agricultural items in the region. These crops have significant implications in India's international trade too. Keeping these facts in mind the paper tries to discuss the growth performance of these four staples and tradable agricultural commodities during the time span of 2001-02 to 2014-15. The trend and pattern of production, productivity, and area under cultivation of these crops shows that except rice, the performance of wheat, pulses, and oilseeds are not that satisfactory and needs major policy changes to improve further.

Keywords: Assam agriculture, production trend, determinants, obstacles, agricultural trade.

Introduction

The economy of Assam is largely an agrarian one. More than 75 percent of the state's population depends either directly or indirectly on agriculture. People engaged with the sector belong to rural for the most part. According to Census 2011, out of the total landmass, 98.4 percent is in rural areas and thus, the agriculture sector remains fundamental to the economy of the state. The sector is providing livelihood to more than 50 percent of its total workforce. The net sown area of the state is 28.11 lakh hectares (87.38 percent) and the gross sown area is 40.99 lakh hectares of the total landmass available for farm cultivation in the state having a cropping intensity of 144 percent. A distinct feature of Assam's agriculture is that it is mostly of mono-cropping nature. Small landholders are accustomed with low input-low output traits and subsistence farming systems primarily depend on the precipitation condition.

Assam can be broadly divided into three distinct physiographic units - the plains, the plateau, and the hills. Based on variation in rainfall, physiography and soil characteristics, the state has been divided into the following six agro-climatic zones: (i) the North upper Brahmaputra valley, (ii) the South upper Brahmaputra valley, (iii) the central Brahmaputra valley, (iv) the lower Brahmaputra valley, (v) the Barak valley, and (vi) the hills. In plains, the farming techniques are more or less similar. But the farming techniques in the hills are significantly different from the plains. Method of shifting cultivation (*Jhum*

Cultivation) is still widely practiced in the hilly region. Generally, the plains of Brahmaputra and Barak valleys are used as the major areas for agricultural cultivation. The principal food crops and cash crops that are cultivated within the state are rice, wheat, maize, pulses, oilseeds, tea, jute, sugarcane, cotton, tobacco, etc. Among all, rice remains pre-dominantly the most important staple crop of Assam.

Purpose of the study

In this study, only rice, wheat, pulses and oilseeds are taken since the first two are major exportable commodities and the latter two are major importable commodities of our country. Keeping in mind the context of international agricultural trade, the study tries to inspect the trend and pattern of production, productivity, the area under cultivation, obstacles faced by the agriculture sector, and related issues of the four selected crops over the years. Accompanying with this, the emphasis of the study would also be to foresee the relevance of the state's agriculture sector to the country's international agricultural trade.

Data

Data on production, productivity, the area under cultivation are collected from various publications of the Economic Survey of Assam, and from some recommended websites and links. Since some data are not available in the mentioned sources, efforts are made to complete the study with data available at present. Nevertheless, due to the absence of enough literature on wheat, pulses and oilseeds specifically for Assam, the base for the study and analysis for these three would be from various publications of the Economic Survey of Assam. To examine the growth pattern of the selected crops, simple line diagrams and charts are used. Trendlines are used to validate the trends of selected determinants of the crops.

Problems associated with agriculture of Assam

The productivity of agriculture is often affected by floods and droughts. Flood occurs several rounds in a year. Recurring floods and hence increasing production risk provide a route for the farmers to adjust the cropping pattern. This resulted in a decline in the acreage share of *kharif* crops and an increase in acreage share of *rabi* crops (Goyari, 2005; Mandal, 2010). Farmers who are intensely and recurrently affected by floods resorted with a diversified cropping pattern that provides the maximum utilization out of the crops cultivated (Mandal, 2014). But this diversification, in some regions, seems towards inferior crops (De and Bodosa, 2014). The production growth of summer rice in some zones is pretty noticeable and is gaining preference due to its higher yields per hectare compared to the other two (Bhowmick *et al.*, 2006). An increase in rice production was mainly due to an increase in yield than expansion in areas under rice cultivation (Mech, 2017). Considerably, the productivity of *kharif* crop is more stable than other *rabi* crop and autumn crop (Talukdar and Beka, 2005). However, there are many potentialities of *rabi* crops in Assam. But predicaments like inadequate post-harvest technology, lack of proper irrigation facility and market regulations, lack of agricultural research and back-up support, limited use of HYV seeds, the paucity of adopting proper cropping pattern, etc. limit its production and productivity prospects (Gogoi and Bordoloi, 2011). Another exasperating factor that affects Assam's agriculture adversely is the uneconomic and fragmented landholding.

Depending on agro-climatic conditions and growth potential of the state, various steps have been taken to enhance agriculture growth namely providence of better irrigation facilities, required amount of

fertilizers and pesticides, use of HYV seeds, adoption of multi-cropping farming system, adoption of organic farming technology and modern farming procedures, special use of bio-fertilisers and bio-pesticides, development of infrastructure and agricultural market system, etc. To some extent, these strategies worked, but not as expected.

Potential Role and Contribution of Assam agriculture to India's agricultural trade

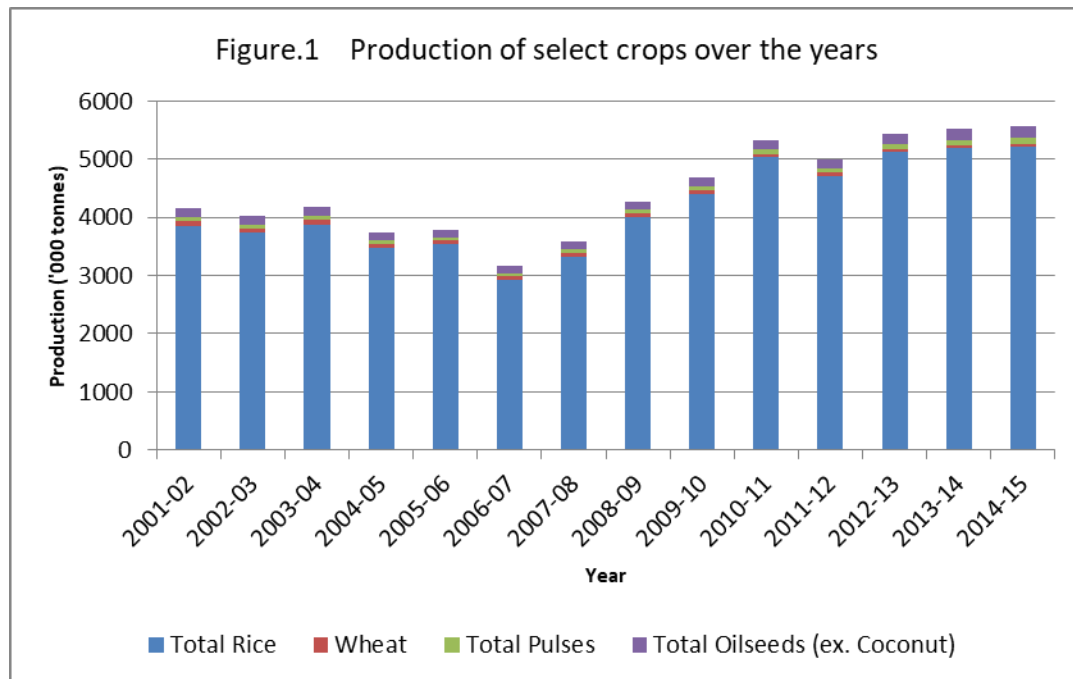
India is the world's second-largest producer of rice and wheat and one of the major exporters of these two in the world market. But to meet the huge domestic demand for rice due to the continuous increase in the population of the country, in 2008 India banned the export of rice. Now, confronting huge demand in the global market and experiencing surplus production India lifted the ban. From the import point of view, India imports huge amounts of edible oil and pulses. To lessen the import dependence of India it is very much important to facilitate the domestic agriculture sector providing necessary inputs, raw materials, etc. Import dependency leads to India's balance of payments deficit. Therefore, to balance the country's balance of payments, it is very important to lift up exports by realising surplus production of crops. This would not only earn valuable foreign exchanges but also ascertains a favourable balance of payments situation of the country. Therefore a little effort is made to study Assam's agriculture just to check whether Assam contributes to the nation's agricultural trade.

Production Performance of Selected Crops

Although various kinds of food crops and cash crops are produced in the state, rice solely occupies about two-thirds of the total cropped area. The economy of Assam is heavily dominated by rice cultivation in terms of production, productivity and area. Following traditional methods of cultivation, rice is grown throughout the year categorised as autumn rice, winter rice and summer rice. Winter rice occupies the majority of the area cultivated and. However, needless to say that, being a heavily rain-fed area and having favourable agro-climatic conditions, Assam is able to stand as a significant rice growing state. Apart from this, continuous increase in population and demand for rice within the state leads to low per capita availability of rice and makes Assam a net importer of rice (Pegu and Hazarika, 2016).

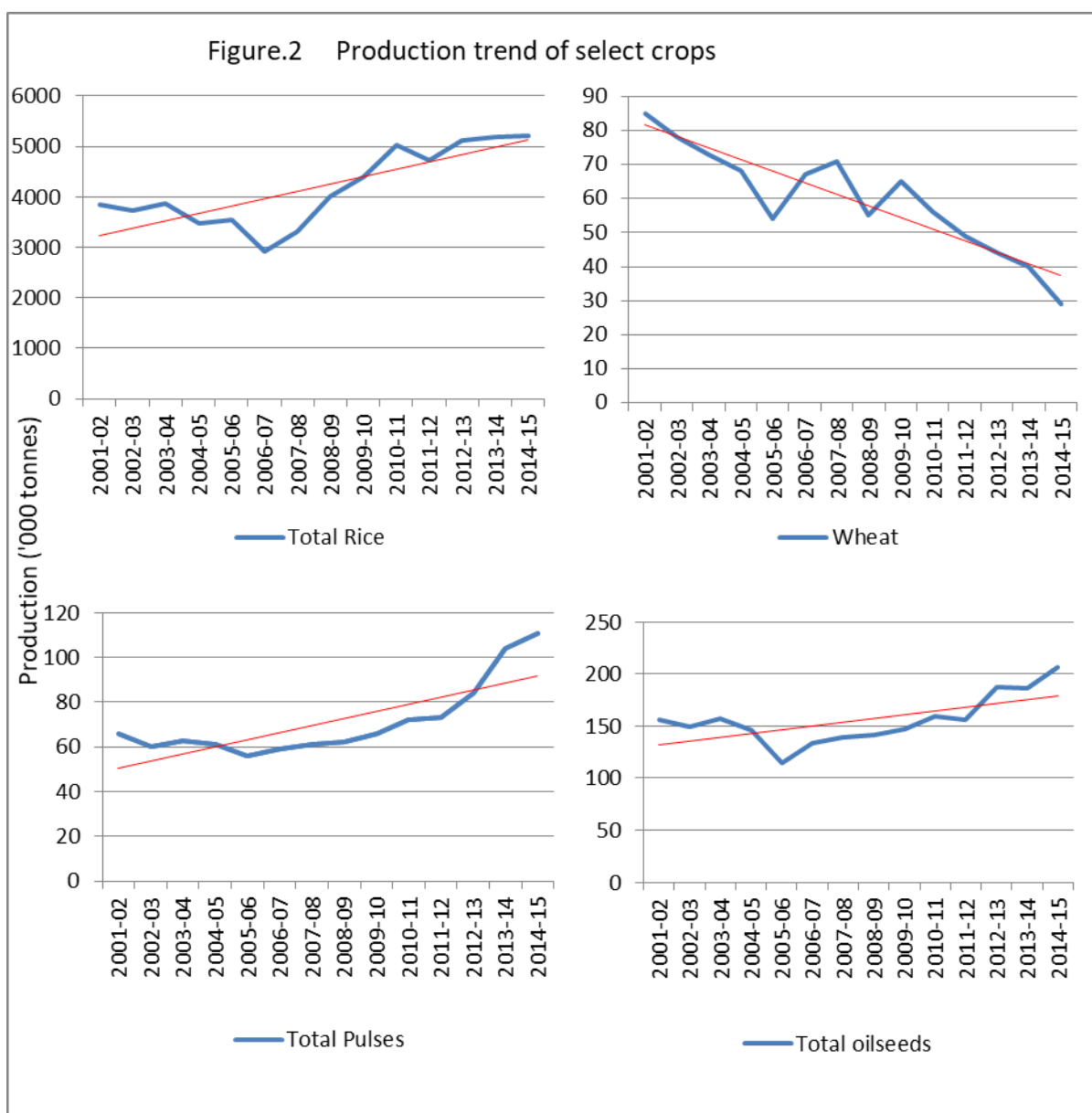
The following figure (1) shows the growth of production of total rice (autumn rice, winter rice and summer rice), wheat, total pulses, and total oilseeds (excluding coconut). It is evident from the figure that the growth of production of rice over the years has increased significantly, while the others have not performed so well when compared to rice. Production of total rice in 2001-02 was 3854 thousand tonnes which reached to 5223 thousand tonnes in 2014-15. From data available, it is found that due to some drought-like situation production of rice has experienced negative growth in the years 2002-03 (3.01 percent), 2011-12 (6.3 percent), 2004-05 (10.57 percent), and 2006-07 (17.91 percent). Adoption of the System of Rice Intensification (SRI) and the use of hybrid seed in the state can be considered as the driver of piling up production and productivity of rice. SRI promotes the use of low-volume seeds, fertiliser, irrigation facilities, low cost of production, and also shortens the duration of harvesting. It also influences the double cropping system. However, in the case of wheat, except in the years 2006-07, 2007-08 and 2009-10, it has experienced negative growth over the years and performed worst in 2014-15, left with only 29 thousand tonnes of production which was 85 thousand tonnes in 2001-02. Negative growth of production is observed during the whole study period. Conversely, the two importable commodities

namely, total pulses and total oilseeds have shown moderate growth which is not sufficient to reach at the level of self-sufficiency. Production of total pulses has increased from 66 thousand tonnes in 2001-02 to 111 thousand tonnes in 2014-15 and the growth in recent years is quite satisfactory. Again, the growth of total oilseeds (excluding coconut) production also shows a positive trend, except a substantial decrease of almost 22 percent (compared to the previous year) in 2005-06. Overall, the production of the selected food grains shows a positive trend except for wheat. But it is noticeable that the production trend of rice during the last few years is almost stagnant. One of the main reasons for this is the low usage of nutrients¹. The production trend of rice, wheat, pulses, and oilseeds is clearly observable from figure (2).



Source: Economic Survey of Assam 2016-17

¹ As stated by International Plant Nutrient Institute. <http://sap.ipni.net/article/assam>



Source: Trend lines (red straight lines) are calculated using data from the Economic Survey of Assam 2016-17

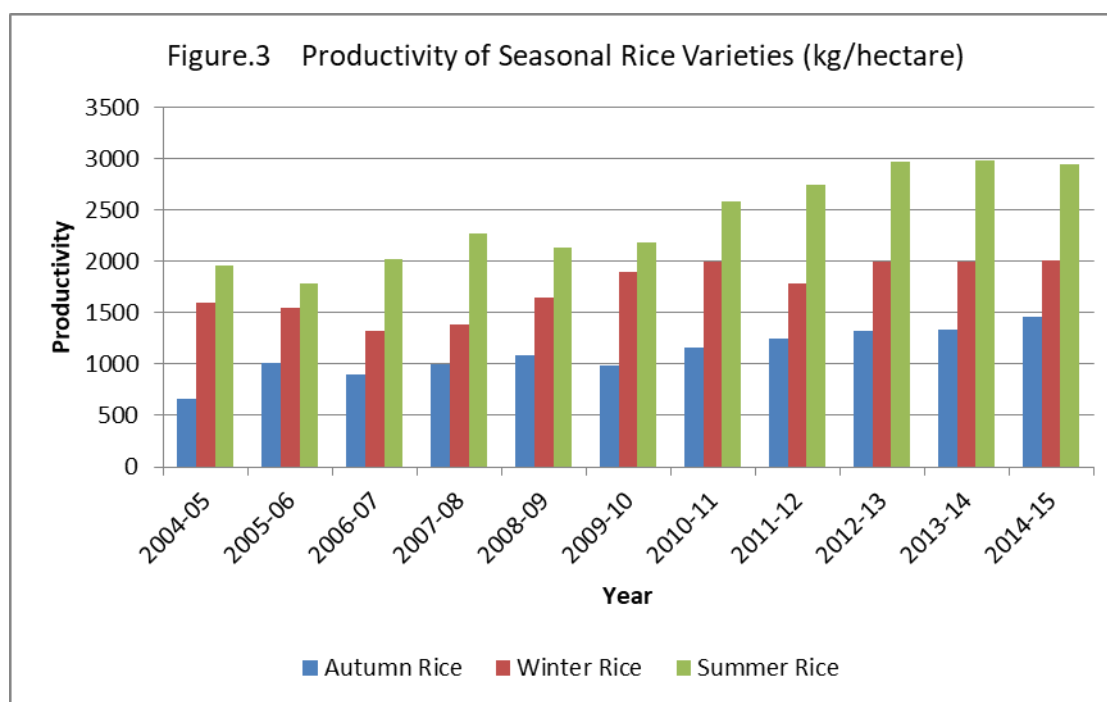
It is evident from table (1) that, area under High Yielding Variety of rice has increased from 59.9 percent (to total HYV rice area) in 2005-06 to 70.7 percent in 2014-15. HYV rice area under winter rice has been increasing significantly from period 2005-06 to 2014-15 while, on the other hand, it is been decreasing for autumn rice during the same period, and summer rice showing some fluctuations. But the share of productivity of summer rice is much higher than the other two (figure 3).

Table.1 Area under High Yielding Variety Rice (in lakh hectares)

Year	Autumn Rice	Winter Rice	Summer Rice	Total HYV Rice area
2005-06	2.35	9.5	2.65	14.5 (59.9)
2006-07	2.15	8.63	2.67	13.45 (61.4)
2007-08	2.23	8.94	2.78	13.95 (60.0)
2008-09	2.24	9.75	3.14	15.13 (60.9)
2009-10	2.29	10.2	3.41	15.9 (62.8)
2010-11	2.13	11.34	3.54	17.01 (66.2)
2011-12	2.19	12.8	4.02	19.01 (74.0)
2012-13	1.6	11.7	3.61	16.91 (68.0)
2013-14	1.43	12.22	2.24	15.89 (63.5)
2014-15	1.28	12.42	3.95	17.65 (70.7)

Source: Directorate of Agriculture, Assam.

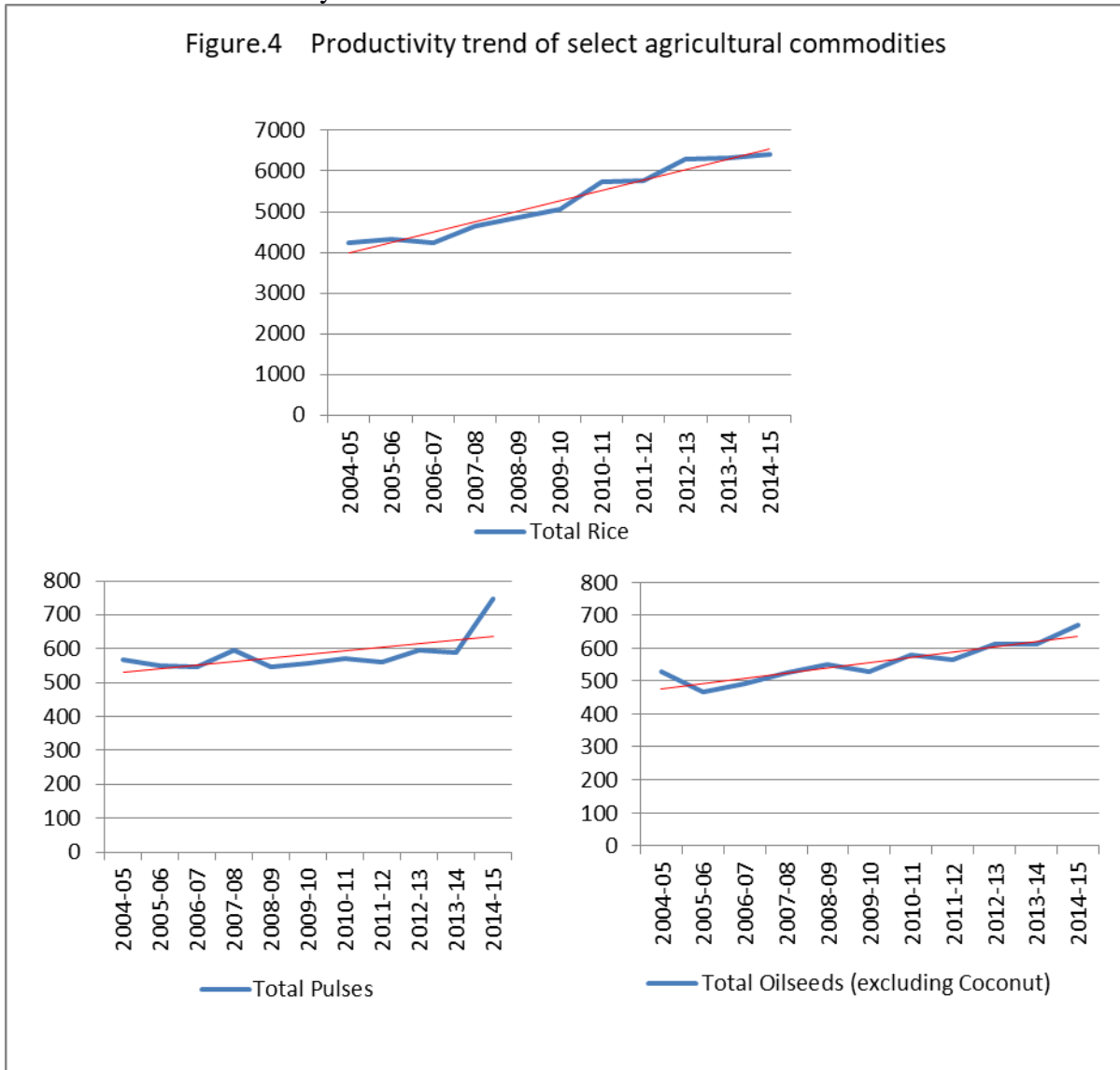
Figures in brackets show the percentage to Total Rice Area.



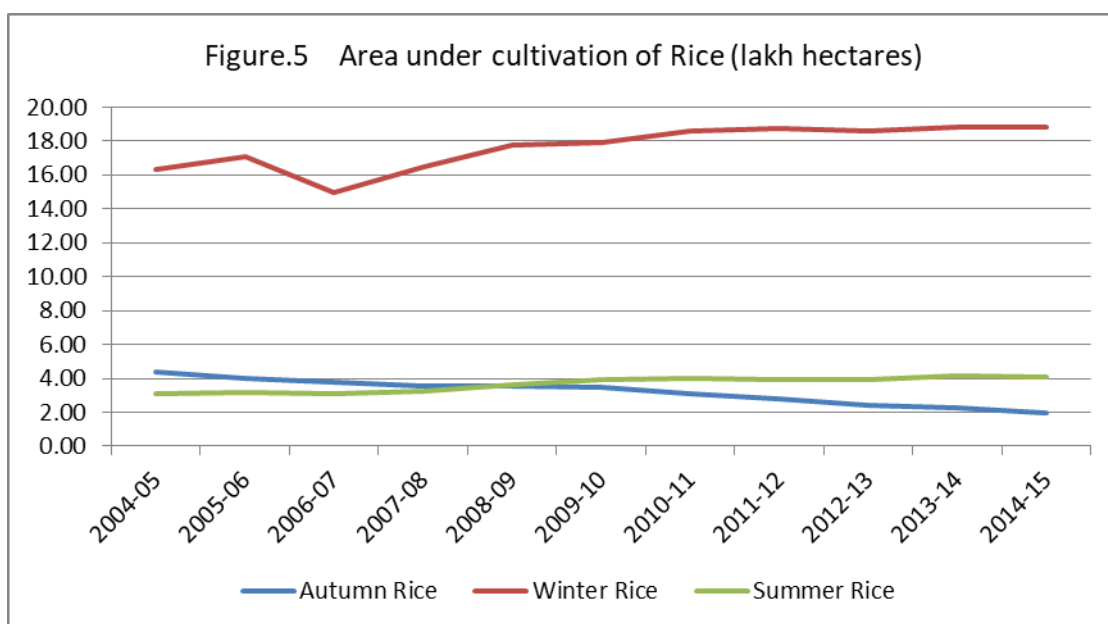
Source: Economic Survey of Assam 2016-17

In figure (4), the productivity growth of rice shows a sharp positive trend from 2004-05. But from period 2013-14 onwards the growth remains almost stagnant with some marginal increases. The productivity of total rice in 2004-05 was 4224 kg/hectare and in 2014-15 it has increased to 6399 kg/hectare. But, there is no any observable improvement in productivity of total pulses and total oilseeds. In 2004-05, the productivity of total pulses and total oilseeds were 569 kg/hectare and 529 kg/hectare respectively, and in 2014-15, the figures have increased marginally by 749 kg/hectare and 670 kg/hectare respectively. The trend lines for both the crops are stagnant and almost parallel to the horizontal axis. Therefore it is clear from the following figure (4) that the productivity of total rice is much higher than the productivity of total pulses and total oilseeds. Trend lines reveal that the productivity growth trend of total pulses and

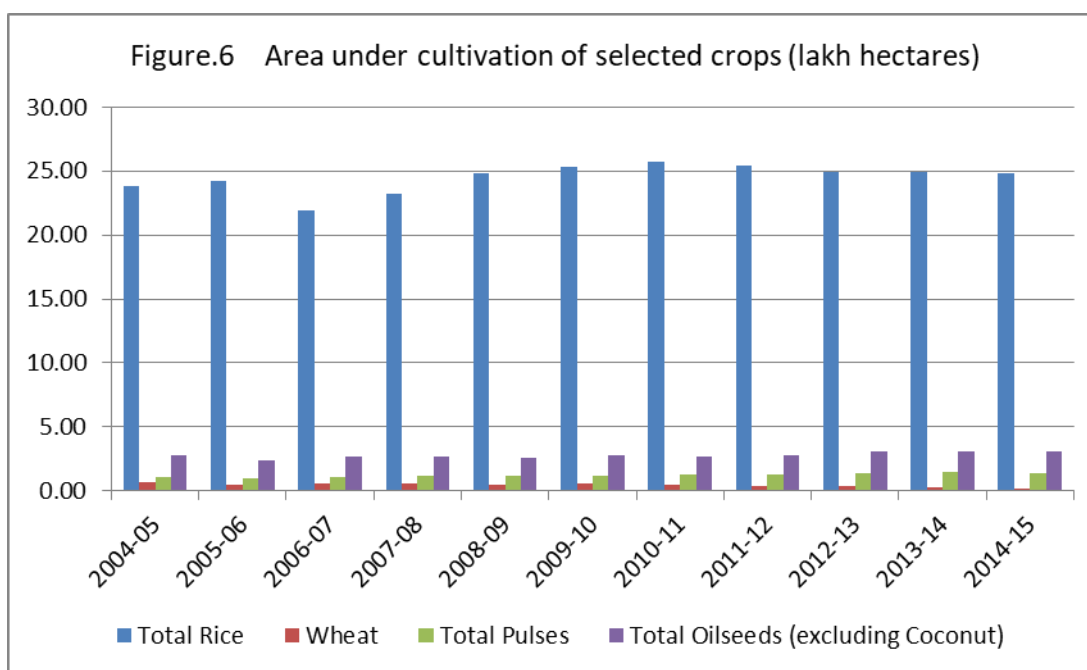
total oilseeds are almost stagnant as compared to that of total rice. The productivity of wheat cannot be studied due to the unavailability of data.



Source: Trend lines (red straight lines) are calculated using data from Economic Survey of Assam 2016-17



Source: Economic Survey of Assam 2016-17



Source: Economic Survey of Assam 2016-17

Figure (6) depicts that total rice covers the majority of the cultivable land and some meager amount is covered by the other three major tradable crops among which wheat ranks last. In 2014-15 an area of 18.83 lakh hectares is under winter rice cultivation and 1.96 lakh hectares and 4.05 lakh hectares of cultivable land is under autumn rice and summer rice, respectively. The total area under rice cultivation has been extended significantly over the years. The area under cultivation of summer rice has also been extended during the study period, albeit by some small amount, while the area under autumn rice has been contracted during the same period (figure 5). Extension of the area under cultivation is positively correlated with the production and productivity of all the crops. Important to note that the correlation coefficient between wheat production and area extension is 0.96 which clearly explains that due to

continuous contraction of the cultivable area under wheat production, its trend of production falls down consistently over time.

One of the important determinants of production and productivity of agriculture crops is average rainfall. According to State Agriculture Department, the overall pattern of rainfall in all the seasons (*kharif* and *rabi*) is found to be normal during 2007 to 2015. It is observed that consumption of fertilizers in Assam is very low in *kharif* season. Farmers are reluctant to invest on fertilisers due to fear of loss for heavy rainfall and flood, and consumption of fertilisers during summer and *rabi* season is low due to its non-availability. However, the use of bio-fertilisers and bio-pesticides gives tremendous results in the production and productivity of crops and also maintains soil health.

Conclusion

Referring to the proposed study, it is evident that the cropping pattern of Assam's agriculture is mainly dominated by rice itself. But it is noticeable that the production trend for rice during the last few years is significantly stagnant. The performance of wheat, pulses, and oilseeds is not satisfactory in terms of production, productivity, and area under cultivation. The pace of agricultural growth in Assam has been slower than that of the overall agricultural growth of the country. Although various schemes have been undertaken by Assam Agriculture Department to enhance production and productivity of the crops, yet the performance of wheat, total pulses and total oilseeds which are considered as staples as well as major tradable crops are not satisfactory. Considering the uncertainties in the production of *kharif* crops due to heavy floods and high rainfall, more emphasis is given on *rabi* crops by the State Agriculture Department by developing assured irrigation facilities through installation of pump sets, etc. Factors like low use of inputs, the occurrence of heavy flood, unusual rainfall, farmers' fear to adopt new farming technologies, lack of awareness among farmers, technological backwardness, etc. are claimed to endorse low level of production and yield. Despite the excellent potential for increasing food grain production and productivity, Assam lags far behind due to impediments like low credit availability, lack of mentorship by agricultural experts, poor extension facilities and infrastructure bottlenecks, etc. International Plant Nutrition Institute (IPNI) clearly states that '*along with dependence on traditional agricultural practices and traditional varieties, very low use of nutrients is the major reason for stagnation or decline of crop productivity in the state*'. To lessen these hurdles Central Government along with State Government have taken some strategies like Bringing Green Revolution to Eastern India (BGREI), double cropping, the supply of improved seeds, fertilisers and providing farming technology equipment, etc. Proper planning, implementation, monitoring, and regulation of these strategies can bring out targeted results.

As we have seen from the above analysis, according to the state's agro-climatic conditions and all other factors affecting production and productivity, the performance of rice is quite well whether it is production or productivity or area extension. The production and yield rate of wheat, total pulses and total oilseed is not satisfactory in the state. It is evident that Assam's agricultural economy is largely dominated by rice cultivation. A variety of good quality and local variety rice is cultivated within the region throughout the year. Moreover, Assam lies under the top ten rice-producing states of the country. Since we do not have adequate microdata on Assam's export quality rice, we cannot claim that the surplus product from the region is actually exported internationally or not. But it is needless to say that Assam contributes to the country's aggregate production basket which directly or indirectly links itself to agricultural exports from India. Similarly, although Assam does not fall under major wheat-producing states, yet it can contribute to the nation's domestic wheat consumption basket. In the case of pulses and oilseeds also, a low level of production and yield rate indicates more dependency on imports which is a negative signal for the state as well as the country's economy.

We have studied these four crops categorising them as major exportable and importable agricultural commodities because of their significant importance in the international market. If adequate facilities are provided, Assam's agriculture not only would gain self-sufficiency but also would play a crucial part in contributing to the international trade of India. Proper agricultural policies should be undertaken to improve the production of wheat, pulses, and oilseeds as these hold a strategic position in core staples as well as India's major tradable crops. Adequate inputs should be provided to the farmers and more emphasis should be given on improving existing schemes and policies along with up-gradation of agricultural infrastructure and agricultural research and development.

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