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EXAMINING THE GOVERNMENT POLICIES RELATED TO ENHANCEMENT IN THE PRODUCTIVITY OF AGRICULTURE SECTOR, AND ROLE OF MAJOR CROPS AND LIVESTOCK FOR ECONOMIC DEVELOPMENT OF PAKISTAN DURING 2015-16 TO 2020-21

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ABSTRACT

Agriculture sector is indispensable to the country's economic evolution, employment generation, food safety, and poverty mitigation particularly, at the rural level. The performance of agriculture sector has increased by 2.7% against the target during 2020-21 because of good policies and initiatives by Government. In this paper, we studied the major factors that decreased the productivity of agriculture during crises year 2015-16 and back. For this purpose, an empirical study based on crops, livestock, and agricultural inputs data was obtained from the Crop Reporting Service (CRS), Agriculture Department, and Bureau of Statistics (BOS), province of Punjab. The reason for the use of only Punjab province data is that it represents 80% of the agriculture sector in Pakistan. We statistically measured the agriculture productivity by comparing the importance of the role of major crops, and livestock on exports of Pakistan. The results showed that there has been a correlation between response variable and predictors. In addition, livestock population and rice production have a significant effect on the exports of Pakistan. The exports of goods and services stood at $31.3 billion in 2020-21 which is 92% higher as compared to 2015-16. The role of support price (SP) on agricultural productivity has also been analyzed during these years (38% increase in wheat, 8% in sugarcane) and the results showed that large support price has positive impact on the productivity of major crops like wheat, rice, and sugarcane but there is not much impact on cotton crop. The production of major crops in 2021, such as wheat (7.3%), sugarcane (36%), rice (51%), and maize (78%) indicated significant improvement as compared to 2015-16 and exceeded the production targets due to good support prices. The role of input data (DAP, urea, diesel rates, electricity consumption and agricultural credit) on agricultural productivity has also been studied and conclude that production of major crops increased by controlling the prices of DAP, urea, diesel and providing the electricity at very cheap rates. In the end, a few recommendations are put forward to enhance the productivity of agriculture sector. Quality research for improving crop technologies, dissemination of information by good extension services, use of quality inputs at affordable prices, easy access to credit, promotion of high efficiency irrigation techniques with proper conservation of land & water, land reforms, change in crop patterns will have an overall positive impact on the economic development of Pakistan.

KEYWORDS

Gross Domestic Product (GDP), Support Price (SP), Crop Reporting Service (CRS), Bureau of Statistics (BOS), Major Crops: Rice, Wheat, Cotton, Sugarcane, Maize.

1. INTRODUCTION

Our country has one of the best agriculture systems. Agriculture can become the essential driver of economic development and poverty mitigation in the country. The main target of countries is to achieve economic growth for their development. This varies from country to country but the agriculture sector plays a significant part in the economic expansion. It strives to achieve self-sufficiency in food through livestock, horticulture, and crops like rice, wheat, sugarcane, and pulses. The fiber and other raw materials provided by agriculture sector lead to industrial growth, therefore, leading to export surplus. This surplus will help in the earning of foreign exchange.

We can achieve the Macroeconomics objective by long-term evolution in agriculture sector through its connection with the other sectors.

The growth rate of agriculture sector during 2015-16 is 3.85% (0.85). It accounts for 18.9% of Gross Domestic Product (GDP) and fetches 80% of the country's total export earnings. This sector is very important for food security for the population and provides income to individuals directly involved with this sector and associated with value added chain. It also provides employment (38.5%) and is an important source of inputs for agro-based industry. This sector's income creates demand for industrial goods especially for manufactured products (Usman, 2016).

Agricultural growth is essential and it can be attained with the use of needed inputs, therefore, leading to increase in productivity. The vital physical inputs for agricultural production growth include land, labor, water, seeds, pesticides, and fertilizers. The other component of agricultural growth is increase in productivity. The growth of agriculture sector played an important role in the industrial development of England in mid-eighteenth century and that of Japan in the late nineteenth century. At the same time, the recent industrial development of China, Vietnam, and India are also because of robust agriculture growth (Raza & Siddiqui, 2014).

Poverty reduction and economic growth are only possible to increase agriculture productivity and have direct effect on rural welfare. The increase in rural individual income increases the total demand for goods and services in the economy. The agricultural growth gives enhancement to exports which help in earning of foreign exchange for the country.

The composition of agriculture value added has changed in favor of crops other than major crops and especially livestock since early 1980s. In the last 10 to 15 years, the share of food crops like wheat and rice has increased while the share of cotton and sugarcane has decreased. These changes also emphasize the movement of relative prices of commodities compared to output. The changing importance of agriculture in the economy of Pakistan can also be assessed by its contribution to GDP which has decreased from 50 % to 18.9% since 1947. The agricultural population has gone down from three quarters to below one-half and the agricultural labor force has contracted from 68% to 42.3% since independence. The direct share of agricultural products in exports has also fallen from 36% to 10 % in last seven decades (Khan, 2006).

The role of livestock sector in enhancing agricultural productivity is important. Livestock sector includes cows, buffaloes, goats, sheep, and poultry. This sector contributes 11% to the national GDP (Raza, Ali, & Mahboob, 2012). Pakistan has a large dairy sector following the United States of America (USA), China, and India. The current production of milk is 35 billion liters with 8 million agricultural households and total sheep size of 50 million. In financial terms, the worth of milk production in the country is almost Rs. 177 billion. Only 3 to 4% of total milk production is being managed and promoted through proper channels. The growth in livestock sector is more stable and reliable as compared to crop sector. The unemployed and untrained rural labor can be employed in livestock sector as this sector is labor intensive. This will lead to generation of more income for farmers thus reduction in rural unemployment and rural poverty.

Punjab province has 69% of total cropped and 57% of total cultivated area of country. Total geographical area of Punjab is 20.63 (million hectares), out of which 12.51 (million hectares) is cultivated. In total 3.33 million hectares are irrigated with canals and 2.94 million hectares are irrigated through tube wells. Punjab (Province of Pakistan) contributes the main stake in the agricultural budget of the country, i.e. cotton (73%), wheat (80%), fine aromatic rice (97%), sugarcane (63%) & maize (51%). Among fruit, mango accounts for 66%, citrus 95%, and guava 82% of total national production of these fruits.

In last thirty to forty years, certain important structural changes took place in the agriculture sector. Livestock has emerged as a significant sub-sector contributing 56% of agricultural GDP compared to about 28%, two decades ago. Milk, a single livestock product, values more than the combined value of agricultural crops. Similarly, fisheries and forestry have grown rapidly. The electricity for tube wells was subsidized previously. One of the important policy interventions by the government is to prevent the prices of farm products drop too low to make agriculture farming economically non-viable for farmers. Therefore, to keep agricultural farming viable, governments tend to fix minimum support prices for crops like wheat, sugarcane, and rice by taking in to account the cost of production, inflation, and international prices. Historically, in Pakistan, increase in support price has led to increased productivity of wheat, rice, and sugarcane.

2. LITERATURE REVIEW

In the economic development of a country Agriculture, plays an important role. It not only responsible of feeding to whole population but also has strong correlation or interaction with almost all important sectors of industry of this country. It is reported that stability of a country, politically or socially can be measured by the success rate of agriculture sector. The factor that is creating hurdles in the development of sustained economic growth is volatility that is vital objective of an economy. In Pakistan, complexity is very high in the economic volatility patterns. The sectors which are experiencing high volatile rate are industry, agriculture as well as services and others like transport, distribution and communication are reported least volatile in terms of GDP.

A study was performed by Dawson (2005) and concluded that in under developed countries, the share of agriculture exports is not so high for economic growth. The study was made on two theoretical models. In the first model agricultural and nonagricultural exports were taken as inputs in agricultural production function. While other model was

based on dual economy model in which both agricultural and non-agricultural inputs were further divided into subsectors of export and non-export. The panel data of under developing sixty countries were collected for the time period of 1947-1995 and in each model fixed and random effects were checked. The final results showed the positive relationship between agricultural exports and economic growth rate.

In an experiment performed in Pakistan by Aurangzeb (2006) and results of correlation between agricultural exports and economic growth rate were estimated. In study, higher social marginal productivities were experienced by increasing export sector range. So, the analysis confirms that for higher economic growth rate this country should be export oriented.

Another study carried out by Kwa and Bassoume (2007) experienced the relationship between sustainable economic development and exports of agricultural based products. They examined that in Pakistan, the performance of agricultural exports is affected by economic reforms and liberation of trade policy. They also checked the performance of agricultural exports and influence of both domestic supply side as well as external demand on it. The final result of their experiment was that the changing in domestic factors influenced the performance of agricultural exports.

The contribution of agricultural exports in the development of economy in under developed country was studied by Lopez and Dawson in 2010. They find out the relationship between agrarian and non-agrarian domestic products. Their research showed 0.07% and 0.13% elasticity in export of agrarian and non- agrarian sectors respectively in terms of GDP. They suggested that the under developed or less developed countries should improve their export promotion policies of agricultural sector as well as non-agricultural sectors for economic progress. In developed countries economic growth rate is also high due to exports of non-agrarian based products.

The relationship between GDP growth rate and agriculture in Pakistan studied by Anwer et al. (2015). They examined that 1% increase in growth rate of agriculture cause 0.34% raising of GDP. Similarly another study showed that decrease in agricultural yield cause reduction in industrial output because industrial raw material necessary for its manufacturing comes from agricultural resources. Hence, positive relation has been observed between these two parameters i.e. agriculture growth and economic development (Golin, et al., 2002).

Awan and Aroosa made an analysis and observed the role of agriculture in the economic growth rate. They carried out this study through livelihood that is big source of environmental services of any society. While, role of livestock is significant in agriculture sector of Pakistan. It was estimated that it adds about 56.3% share in economic growth. It also noticed that about more than 35 million people are involved in this sector and share in GDP is about 11% of this country.

3. RESEARCH METHODOLOGY AND DATA COLLECTION

The methodology used during the study was quantitative and qualitative. The related data and research material were collected from sources like interviews of experts from agriculture sector, the articles related to agriculture sector in national and international

journals. The secondary data in respect of major crops, livestock and agricultural inputs for the last twenty-five years was collected. The source of data in addition to other sources is predominantly from Pakistan BOS, CRS Punjab Agriculture, and Livestock departments. The analysis of secondary data was done by descriptive statistics and developing different statistical models. In one model, Exports' volume (million) use as response variable for our study and production of cotton in Punjab ('000 tons), production of rice in Punjab ('000 tons), and population of livestock in Punjab ('000 heads) use predictor variable. As contribution of province of Punjab towards total agricultural sector is 80% of Pakistan that's why only Punjab's cotton & rice production and livestock population have been taken as predictors in the study.

4. DATA ANALYSIS AND RESULTS WITH INTERPRETATION

Volume of exports of a country and subsequently trade deficit is one of the parameters for measuring economic growth of the country. In this study, volume of exports of Pakistan for the last twenty-five years 1996-97 to 2020-21 along with total production of cotton, rice (including both basmati and non-basmati varieties) and total population of livestock (cattle, buffalo, goat, sheep) of the concerned years have been taken for studying the impact of agriculture sector, especially crops and livestock sectors, on the economic development of Pakistan in the supposed time period.

4.1 Descriptive Statistics

During last twenty-years there is an increasing trend in exports of rice and rice production whereas cotton production showed more variation and has no specific trend with respect to exports as depicted in the table 1 which means that cotton production is the most un-predictable of all crops. The following table shows maximum and minimum values of the said variables with their respective years.

Table 1
Descriptive Statistics of Exports, Cotton, Rice, Livestock

Variables		Minimum	Maximum	Mean	Standard Deviation	C.V (%)
Exports	Values	325,313.50	4,174,500	2,108,048	1,090,764	52
Cotton Production	Values	6,306	11,149	8421	1452.15	17
	Years	2019-20	2004-05			
Rice Production	Values	1,864	5,917	2,905	1018.63	35
	Years	1996-97	2020-21			
Live Stock Production	Values	38,219	52,819	44,926	7,328	16
	Years	1996-97	2020-21			

It is important to note that minimum exports' volume and minimum rice production was in the same year i.e. 1996-97. It shows a significant amount of correlation between both the variables. It is also significant to observe that minimum cotton production in the last twenty-five years was in 2019-20 and it was mainly because of sudden attack of boll

worm in cotton belt of Punjab. Population of livestock has been showing gradual increase in the last twenty-five years continuously.

Table 1 also shows the descriptive statistics of all three variables. The results given in the said table show that exports of Pakistan has an average value of Rs. 2,108,048 million with a variation of 52% over the last twenty-five years. i.e., exports can vary 52% of average value (standard deviation) on either side from year to year. Cotton production shows a more consistency (17%) as compared to rice production (35%). Livestock population is showing maximum consistency i.e., 16% variation in its population which is minimum.

Livestock is an important sector which contributes about 56% of value addition in agriculture and closely 11% to the GDP. Livestock improvement can also be measured by fodder crop. Fodder production has significantly increased in 2015-16 to 2020-21. That is symbol of improvement in livestock sector. In order to focus the real performance of this sector, the below table 2 depicts the relation between fodder and livestock.

Table 2
Comparative Analysis of Fodder & Livestock, Punjab

Year	Area (000 Acre)	Prod (000 Tonns)	Prod (Inc./Dec.)	Livestock (Numbers)	(Inc./Dec.)
2015-16	4,696	43,187	61%	49,690	6%
2020-21	8,451	161,472		52,819	

Since 1995-96 to onwards, the production of wheat, rice, sugarcane and cotton crops has shown a positive trend in the wake of announcement of either support price or increase in support price for the said crops. For example, support price for wheat was enhanced from Rs.240 to Rs.300 in 1999-2000, therefore, leading to increased production of wheat from 13212000 tons to 16480000 tons (an increase in 25% productivity). Again in 2008-09, the wheat support price was increased from Rs.625 to Rs.950, thus leading to increase in production from 15607000 tons to 18420000 tons (an increase of 19% productivity). In 2012-13, wheat support price was again raised from Rs.1050 to Rs.1200. This led to increase in production from 17738000 tons to 18587000 tons (an increase of 10.2% productivity). Predominantly, positive trend between increase in support price for wheat and productivity can be seen. For better understanding, a comparison of 2015-16 and 2020-21 shows in below table 3.

Table 3
Effect of Support Price on Production of Wheat Crop, Punjab

Years	Area	Production	Support Price	%age Inc./Dec.		
	Acre (000)	Tonns (000)	(Rs./40kg)	Support Price	Area	Production
2015-16	17085	19526	1300	38%	-2%	7%
2020-21	16670	20900	1800			

In 1996-97, the support price for sugarcane was increased from Rs.24 to Rs.35, the production of crop increased from 24010000 tons to 32110000 tons (an increase of 34% in productivity). In 2015-16 the support price was raised from Rs.100 to Rs.125, this incentive increase of 20% in productivity. During the year 2020-21, the support price was increased from Rs.1400 to Rs.1800, thus leading to increased productivity from 19402000 tons to 20900000 tons (an increase of 8% in productivity).

The incentive of support price shows that this has led to more cultivation of main crops along with more investments by farmers in the form of inputs to get more productivity. There is no significant impact as far as surplus production of these crops for exports is concerned. After implementation of better govt. policies for agriculture sector, the production of all major crops have significantly impact on economic growth of the country. The following table 4 shows the comparison of production of major crops for the years 2015-16 and 2020-2.

Table 4
Crop Comparison (Production & Support Price), Punjab

Crop's Name	2015-16		2020-21		Bumper Crop History (Production: 000 Tons)	
	Production (000 Tons)	Support Price (Rs/40Kg)	Production (000 Tons)	Support Price (Rs/40Kg)	1st Highest	2nd Highest
Wheat	19527	1300	20900	1800	20900 (2020-21)	20466 (2016-17)
Rice	3502	1804	5301	1803	5301 (2020-21)	4144 (2019-20)
Sugarcane	41968	180	57000	200	57000 (2020-21)	55068 (2017-18)
Maize	4391.2	1061	7038	1167	7038 (2020-21)	6995 (2019-20)
Cotton	6343	3181	5044	4209	11416 (1991-92)	11149 (2004-05)

In the above table, all major crops have highest production in 2020-21 as compared to last five to six years, especially in last three years. It shows that Government have improved agriculture polices in the specified years.

In case of cotton crop either the fixation of support price or increase in same has not much impact on the productivity. There were years when even increase in support price could not increase the productivity. On the contrary there were years during which productivity of cotton crop increased despite the fact that there was no increase in support price. This fact demonstrates that cotton crop being the main cash crop is being cultivated by the farmers irrespective of the fact that there is or no increase in support price of crop. The productivity of this crop also depends on natural factors like weather and viral attacks

on the crop etc. Thus in case of cotton crop there is no direct relationship between support price and productivity.

The Input data (DAP, urea, diesel rates, electricity consumption and agricultural credit) on the agricultural productivity has very significantly impact. Table 5, shows the descriptive statistics Total production (sum of production of five major crops) and all input variables, i.e. Price of Urea per bag, Price of DAP per bag, total amount of agriculture credit disbursed in Punjab, agricultural electricity consumed and price of diesel per liter for the last twenty-five years (1996-97 to 2020-21).

Table 5
Descriptive Statistics: Total Production and Input Variables

Input Variables	Mean	S.D	C.V (%)
Total Production (Million Tons)	55930	8007	14
Urea Baig (Rs./Bag)	1400	666	77
DAP Price (Rs./Bag)	4100	1393	74
Agri Credit (Rs. Million)	41810	23025	55
Agri Electricity (Million KWH)	3731	837	22
Diesel Rate (RS./Liter)	80	36	58

The following table 6 shows that there is significantly positive impact of production of major crops on economic evolution of Pakistan. In 2015-16, the value of total production of major crops was 1504 billion (Rs). This amount has significantly increased (almost 36%) in 2020-21 by good policies of government in agriculture sector.

Table 6
Comparison of Production Value of Crops

Crop's Name	2015-16	2020-21
	Billion (Rs)	Billion (Rs)
Wheat	630	731
Rice	184	481
Sugarcane	131	270
Cotton	367	292
Maize	192	270
Total	**1504**	**2044**

4.2 Correlation Analysis between Production and Support Prices

In this section we check the correlation between the production of major crops and support prices. The correlation between production of wheat and support price is 0.866

($p<0.01$), production of sugarcane and support price is 0.830 ($p<0.01$), production of rice and indicative price is 0.805 ($p<0.05$). All correlation results showed that support price (decided by Govt.) of the major crops have significant impact on production of crops.

4.3 Modeling Study

In this section, we statistically measured the agriculture productivity by compared the production of major crops, and livestock on exports of Pakistan (dependent variable). For the purpose, we fit the regression model of total export of Pakistan (dependent variable) and production (000 tons) of rice, cotton, wheat, sugarcane, and livestock (numbers). The association phenomena between the said variables can be presented by using Spearman (non-parametric) coefficient of correlation as shown in the table given below. In case of rice (0.773) and livestock (0.988), it is quite high but for cotton (0.450), it is rather low. It further explains that rice and livestock sector have a significant influence on the exports of a country. The predictor variables are accounting for 79.5% variation in response variable, which is significantly high. The table values of ANOVA (F=70.847, p-value=0.000) shows that predictive performance of the model. We can say with more confidence that overall model is significant and predictors are suitable for predicting on response variable.

Table 7
Regression Coefficients and Standard Error

Model	Unstandardized Coefficients		Standardized Coefficients	t	Sig
	B	Std. Error	Beta		
Constant	-495.251	184.525		-2.684	0.016*
Rice (‘000 Tons)	0.518	0.062	0.898	8.417	0.00***
Cotton (‘000 Tons)	0.014	0.101	-0.043	-0.414	0.685
Livestock (‘000)	0.16	0.01	0.974	18.304	0.00***
Wheat (‘000 Tons)	0.014	0.025	0.086	0.573	0.576
Sugarcane (‘000 Tons)	0.003	0.007	0.54	0.477	0.641

Source: Calculation, *the (*, **,) shows the level of significance at 1% and 5% correspondingly.*

In above table 7, regression coefficient of rice production is 0.518, which shows that by increasing 1000 ton of rice production, square root of Exports of the country is increased (because of positive coefficient) by 0.518 i.e. Exports are increased by 0.206324 (square of 0.518) million. Standard error of regression coefficient of rice production is 0.062 shows that this regression coefficient would be stable from sample to sample with just a variation of 0.062 in its magnitude of 0.518 in either direction. Negative constant value shows that in case of zero rice production in Punjab, the country’s exports volume would be Rs. 245,273 (square of -495.241) million with a standard error of 184.525. The coefficient of determination (R2) is 95.8 indicated that the independent 95.8% variation to the dependent variable.

5. CONCLUSION AND RECOMMENDATIONS

Agriculture is an important sector of Pakistan. In last 55 years, fabulous performance in this sector has been witnessed. Food security is a major issue in Pakistan and with the passage of time it will become the gravest issue of country due to increase in population. To avoid any severe problem of food security, it is very necessary to promote agriculture sector to get sufficient food and its supply along with stability in prices and rise in income of poor-farm households.

Moreover, the sustainable economic development of our country largely relies on agriculture sector. It means on one side we should need to increase production through following all recommendation of basic production technology and on other hand by promoting process clean products. This means for a better standard of living or economic development for sake of progress or to fulfill the need of community as well as the market establishment, not only national but also global development, promotion of agricultural in obligatory. The most noteworthy sectors that have positive relationship with higher GDP growth rate are industry, agriculture, and export or trade.

The government of Pakistan is keenly concerned with major crops monitoring and making such policies and preparing such plans that effectively maintain basic food supply at economical price. The performance of agriculture sector from last two years 2020-2021 is remained satisfactory and encouraging due to exceeding by 2.77% from the target of 2.8%. The production or growth rate of major food crops including rice, wheat, maize, and cash crops i.e. sugarcane and cotton was 4.65 percent during last two years. The production rate of all these major crops as reported wheat (7.3%), maize (78%), rice (51%), and sugarcane (36%) indicated considerable improvement as compared to last five years and surpassed the production targets.

However, due to reduction in area because of severe pest attack and heavy monsoon rains, the cotton crop was affected badly. In twenty-five years, the production of cotton is reduced from 9.148 million to 7.064 bales.

The role of support price (SP) on agricultural productivity has also been analyzed during these years (38% increase in Wheat SP, 8% in Sugarcane) and the results showed that large support price has a positive impact on the productivity of major crops like wheat, rice, and sugarcane but there is not much impact on cotton crop. There has been a correlation between exports and livestock population, and rice production and both are significant effects the exports of Pakistan. The exports of goods and services stood at $31.3 billion in 2020-21 which is 92% higher as compared to 2015-16. In agriculture share of livestock is about 60.07 percent and in GDP 11.53 % which is 3.06 percent of growth.

The role of Input data (DAP fertilizers, diesel rates, electricity consumption, and agricultural credit) on agricultural productivity has also been studied and concluded that production of major crops increased by controlling the prices of DAP, urea and diesel and providing the electricity at very cheap rates. For this reason, during last five years, government has started many subsidy policies to facilitate farmers i.e. subsidies in form of cash on potash and phosphatic fertilizers.

RECOMMENDATIONS

In order to properly tap the true potential of agriculture sector in Pakistan, following recommendations are put forward:

1) Determination of market support price by considering the cost of production, inflation, and government policies. The announcement of support prices should be timely.
2) Create awareness for the adoption of silage making to increase livestock productivity.
3) Value addition at farm level will lead to creation of more jobs. Less rural unemployment would lead to increase in incomes and reduction in rural poverty. The State is to define its role in managing agriculture. Until now, State has emphasized to invest in making the water available for irrigation purposes, enhancing the supply of pesticides, fertilizers and output surpluses so that the farming community not suffered from any crisis.
4) This role of government has actually brought the growth rate in the agriculture sector down instead of taking it up.
5) There is a need for legislation in the reforms for the development of agriculture sector. For progress, reforms must be done both in structure and technocratic terms to bring modernization and commercialization in this sector. For maintaining agriculture production on a sustainable basis, it is indispensable to start necessary reforms in basic infrastructure, production of crops, mechanization, and services of extension.
6) There is requirement of Pakistan to amend its policy orientation to attain maximum benefits from the current feed needs scenario globally. These amendments can be done by increasing per capita yield of crops, solving structural issues, improving farmers crop management skills, producing and using quality seed, resolving infrastructure related issues, reducing post-harvest losses, unlimited and quality of research, and limited the gap between practical application and related research through releasing inadequate funds.
7) In agriculture enhancement, the basic role is of good inputs especially good quality healthy seed. The quality seed of desired characters and its availability to farmers is very necessary and it is possible by adopting best practices in research and development at national and international level. The provision of best seed at domestic and global markets according to basic requirements of farmers should also be maintained.

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