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Farmer's profitability of tomato cultivation in the socio-economic context of Bangladesh: A study at Rangpur district

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Abstract

Bangladesh is primarily an agricultural country. Agriculture is one of the prime sectors of Bangladesh economy. Agriculture is the influential lifestyle of Bangladesh. Agriculture persist an expectant contribution to the Gross Domestic Product (GDP) of the country prior to a greater extent than 50% of GDP. At present greater portion of Bangladesh's GDP comes from the service sector. Nonetheless this, two-thirds of the country's population is affianced in agricultural practices. A variety of crops are cultivated in this country which categorized into two-food crops and cash crops. Vegetable growing is a vital farming activity from the point of view of economic returns. Owing to tomato palatability and vitamin content its demand in general increasing day by day, while its production is far from the requirements. This study was conceded on to taking close together the cost of production and profitability of Tomato producers at Rangpur district. Data was gathered from 100 farmers using simple random sampling method. The Tomato farmers demonstrated individual differences of opinion in their socio-economic characteristics and unconditional majority of them belonged to young age category (20-35 years) having medium family size, primary education level, small farm size (0.01- 0.33 acre). The study additionally denominates that the small farmers were almost profitable likened to others. Main difficulty confronted by the Tomato farmers were lower price of Tomato during harvesting period, lack of good quality seed, higher price of inputs and lack of government intervention etc. Appropriate measures should be necessitated by Government to figure out this problem. The findings of the study will add fundamental economic data on the production practices of Tomato. Ultimately it will be supportive to the planners and policy makers in formulating micro or macro level policy for the improvement of Tomato production in the country.

Keywords: Benefit cost ratio, farming activity, hybrid variety, farm size, fertilizer cost

Introduction

Bangladesh is first and foremost an agricultural based country subdued by crop production. Bangladesh appreciates by and large a sub-tropical monsoon climate. Bangladesh has been notorious for growing large variety of tropical crops particularly rice, wheat, Tomato, jute, pulses, oilseeds, sugarcane etc.

Bangladesh is a country of around 150,000 square kilometers. The population has reached a staggering 160 million and amongst that more than 80% are living in the rural areas. The rural people just make enough to meet their ends and often live under extreme poverty. Seasonal drought, monsoon pouring and winter waves make it cruel reality of life that is built on poor infrastructure and centralized communication system. High population growth offset the increased agricultural production, thereby exacerbating the food deficit and poverty that has resulted in massive loss of willingness to strive among the majority.

Vegetables are the cheapest source of vitamins and minerals and are considered as protective food. In Bangladesh, more than 70 varieties of vegetable are grown round the year in varied seasons. Doctors have been known to promote the consumption of vegetables to alleviate malnutrition and vitamin deficiencies. Production of tomato is mainly done through synthetic farming technique. It is being increasingly realized that enhancing vegetable production especially tomato would ensure the fulfillment of the objective of household food, nutritional and economic security in a single go. The issue of economic security is of utmost importance for Bangladesh's farming community in general and small and marginal farmers in particular.

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Diversification into vegetable crops and increasing commercialization can support the development of the agricultural sector in several ways. Commercialization is characterized by households moving from subsistence systems into semi-commercial and commercial systems (with the main objective of achieving food self-sufficiency), thereby maximizing profits and generating surplus (Pingali and Rosegrant 1995) [7]. It implies increased market transactions since farmers participate in the process to capture gains from specialization (von Braun 1995) [10]. Similarly, increasing capital intensity in production and processing leads to growth in the agribusiness sector. As a result, the number of agro-processing, distribution and farm-input provision companies increases (Reardon and Barrett 2000) [8]. Commercialization can take place on the output side—when the farmer sells their products on the markets—or on the input side with increased use of purchased inputs (von Braun 1995) [10]. If these changes take place, and income and employment opportunities subsequently grow causing an increase in real wages, then increasing commercialization and the development of agribusiness contribute to overall growth and economic development. Yet, little is known on how commercialization-led income growth is actually distributed among different social groups, and whether it actually reduces poverty (von Braun 1995; Barron and Rello 2000; Reardon and Barrett 2000) [10, 8] or how it affects women as compared to men (Spring 2001) [9]. The small landholders are poor, usually undernourished and poverty stricken; and by and large practice subsistence agriculture. They have limited financial resources and are not able to grow major crops like wheat, sugarcane, rice, etc due to long gestation period of these crops. Their plight calls for urgent need to augment their income for ensuring food security and alleviating poverty. The growing demand for tomato is considered to have favorable economic effect on small holders who dominate the Bangladeshi agriculture scenario. They have a distinct advantage in tomato production as vegetable cultivation is labor intensive and small holders have abundant labor. They have small land holdings and can make use of the land more intensively, as tomato are short duration crops and provide regular income to meet the day to day requirements of the family. Besides, with a view to advantage of opportunities arising out of agricultural diversification toward tomato farming particularly for small holders, it is important to assess the profit and income of tomato growers of different farm sizes and particularly the small holders for whom it is being promoted and are being diversified.

Tomato has the status of being a very money-making crop with few 'evenly profitable' substitutes. Among the variety of argues mentioned by the farmers for cultivating Tomato, the profitability portion was overwhelming principal and regarded is an extremely beneficial Vegetable.

Review of Literature

Assessment of related literatures in any research is necessary in the good judgment that it allows for an extent for reviewing the collection of knowledge & information appropriate to the future research. This knowledge & information give an instruction in designing the potential research problem & validating the new determinations.

Completed a study on "Profitability of Summer BARI Hybrid Tomato Cultivation in Jessore District of Bangladesh". These studies revealed that the average yield

of BARI hybrid tomato was found 32.78 t/ha. The average return per hectare over variable cost is observed to be Tk 11,44,387 on full cost basis and Tk 12,07,481 on cash cost basis. On an average benefit cost ratio was found to be 4.19 on full cost basis and 5.09 on cash cost basis. The cost per kilogram of hybrid tomato cultivation was Tk 10.94 and return from one kilogram of tomato production was Tk 45.83.

Akhter *et al.* (2011) [1] conducted a study on "An economic analysis of winter vegetables production in some selected areas of Narsingdi district". These studies revealed that production of all the selected vegetables were profitable. The per hectare gross cost of production of tomato, cauliflower and cabbage were Tk. 118000, 116977 and 120522, respectively and the corresponding gross returns were Tk. 217020, 210000 and 220000, respectively. The per hectare net returns of producing tomato, cauliflower and cabbage were Tk. 97000, 93023 and 99478, respectively.

Ameer *et al.* (2008) [2] highly significant data revealed that maximum yield (9639.3 kg ha⁻¹) was obtained in T-7010, closely followed by T-7012 and T-7008 with 8002.7 and 7897.9 kg ha⁻¹, respectively and all these hybrids showed a non-significant behavior against each other. Statistical alike results were reported for T-7030 and TP-002 with 6121.7 and 5473.5 kg ha⁻¹. PTM-1603 showed minimum yield per hectare of 1375.7 kg followed by 68-F1 producing (3006.6 kg/ha). Being much better fertilizer and environmental responsive hybrids, these hybrids including T-7010, T- 7012 and T-7008 produced better yield.

Hossain *et al.* (2004) [5] reported that tomato variety BARI 7 produced the highest yield (57.02 t/ha) and BARI 5 produced the lowest yield (51.38 t/ha). evaluated seven promising tomato cultivars and found that DT-39 was the earliest to flower (53.5 days), HYT-1 recorded the highest fruit yield of 41.05 t/ha which was at par with that of Selection-7 (35.31 t/ha) and RHRT-33-1 recorded the longest shelf life (15 days), followed by RHRT-6-1(14 days).

Adenuga *et al.* (2013) [3] reported that tomato is one of the major fruit vegetables in Nigeria. In view of its seasonal availability and the need to make it available all-year round, effort must be made to increase efficiency of its production especially during the dry season. A study was therefore carried out to examine the economics of dry season tomato production in Kwara state, Nigeria. It estimated the costs and returns and assessed the technical efficiency of dry season tomato production. A two-stage random sampling technique was used to select 105 respondents for the study. A well-structured questionnaire was used to collect data from the respondents. Major tools of analysis used for the study were the gross margin analysis and the stochastic frontiers model. Results of the study showed that a gross margin of N 18,956.75/ha (US\$ 120.74/ha) was realized from dry season tomato production. Furthermore, the result of the stochastic frontier model shows that age, education status of the farmers and access to credit had significant effect on the efficiency of dry season tomato production. This study therefore highlights the need for government to invest in public education and to make credit available to farmers as a way of reducing the burden of high cost of production.

Objectives

1. To delineate the socio-economic characteristics of Tomato producers in the study area through farm size.
2. To delimitate the profitability of Tomato production across farm size.
3. To ascertain the problems of Tomato cultivation across farm size.
4. To put forward policy implications for improvement of Tomato production in Bangladesh.

Statement of the Problem

Agriculture is the deliverance of Bangladesh. The most important livelihood of the people of Bangladesh is associated with Agriculture. Farmers of this country at the outset produce crops what satisfies family life wants then they exemplify interest on production of cash crop such as cotton, jute, tea, Tomato, coffee, and so on are mostly expected in dealing demand of home market and sell abroad in foreign currency in support of developing countries.

Vegetables are important for both domestic and export markets. Almost all households in Bangladesh include vegetables in their diets. Nutritionally, vegetables are good sources of vitamins, protein minerals and fiber. For those in the producing areas, vegetable production is a major source of income for farmers in time past the production of vegetables was largely subsistence, with a major portion of the produce consumed by the farm household. Due to increase in demand for winter season vegetables, however, producers now see tomato production as a business and produce all year round.

An efficient production system is necessary to ensure increased production. The efficiency of the production system also important since it determines the producer's income, consumers living costs as well as facilitates the allocation of productive resources, among alternative uses. Tomato are high value crops, which require intensive cultural practices and the financial, and labor inputs involved are therefore greater than those required for most staple crops.

Tomato has a substantial implication in nationalized economy. Small hard work has been completed to study the economics of the Tomato production. By the way cost of production and profitability determination should be premeditated. This study will be intended at determining causes of variation and aspect of success among farms growing Tomato; it is indispensable both for the farmers and planners to carry out a program considered for eliciting agricultural production. Updating knowledge on profitability of Tomato is one rationalization of this study. It is essential to evaluate substitute profitability of this investment in terms of land and other resources keen to Tomato farming.

This research possibly will endow with a number of detailed benefits to the individual farmers for efficient operation and management of the farm and also to the research personnel for supplementary studies of related natural history and to the planners and policy makers who provide the farmers centrally for Marco- level strategy assessment.

Methodology of the Study

The survey method is probably the most widely used formal method obtaining farm management data. This chapter discusses about the selection of the study area, period of the study, sampling technique and sample size, data processing and analysis.

Selection of the area: Rangpur district was chosen purposively as a study area because this district is one of the renowned for Tomato production in Bangladesh. Gangachara Sub-district was selected at random from the 7 Sub-district of Rangpur districts as the study area. An opening survey was carried on in some villages of Gangachara Sub-district to collect primary knowledge about the Tomato production, productivity and efficiency of the Tomato growers. After preliminary visit three village's namely Uttor Panapukur, Dhakshin Panapukur and Betgari were selected randomly as the study area. Most of the farmers in these villages used to produce high yielding varieties of Tomato and sell their product to different middlemen. The main criteria behind the selection of the Sub-district were as follows:

1. The selected Sub-district was a good Tomato producing area.
2. The researcher is well-known with the language, living, beliefs, and other socio-economic characteristics of the villages of this Sub-district.
3. Previously such type of study was not conducted in this area.

Period of the study: Data for the study were collected during the month of October'2016 to March' 2017.

Selection of the sample and sampling techniques: A random sampling technique was applied for selecting sample. Through random sampling 100 farmers were selected for the study. Among the 100 farmers, 83 were small, 11 were medium and 6 were large. Farm size was arbitrarily classified on the basis of their land where they produce Tomato and other crops. Farmers having 0.01-0.33 acre considered as small, 0.34-1.00 acre as medium farmers while those having above 1.00 acre as large farmers.

Sources of Data: The study is involved in collection of data both from the primary and secondary sources. Different types of data and their sources are discussed under the following heads:

Primary Data: Primary data were collected by the researcher through personal interview with the respondents. To get accuracy and reliability of data, care and caution were taken in data collection. The researcher's took all possible effort to establish a congenial relationship with the respondents do not feel hesitation or hostile to provide correct data. Prior to interviewing, the objectives of the study were explained to each and every owner of the Tomato growers. As a result, they were convinced that the study was purely an academic one and was not likely to have an adverse effect on their business. During data collection an attention was also paid to the mood of the owners of the Tomato growers.

Secondary Data: I can't get enough secondary data for this study. The secondary sources include govt. publications; annual reports on Tomato cultivation, seminar papers, journals, published and unpublished thesis, and topic relected various books, BBS, web site etc.

Processing and analysis of data: Collected data were scrutinized and summarized for the purpose of tabulation using the Statistical Package for Social Sciences (SPSS) and

Microsoft office Excel 2013. Two techniques of analysis were used in this study, tabular and statistical. Analysis by tabular technique included socio- economic characteristics of Tomato farmers, classification of size of Tomato land, production practices, inputs used and returns of Tomato farmers. Statistical analysis was used to show the effect of inputs used and other related factors of Tomato cultivation.

Results and Discussion

Socio-economic Characteristics of Tomato Farmers: The socio-economic background and characteristics of the farmer’s influences the productions to a great extent. So, a description of the characteristics of farmer is necessary for analyzing the main objective of the present study. Socio-economic characteristics of the farmer’s included their age, family size, educational status, farm size of the respondent. These are described below:

Table 1: Distribution of the Tomato farmers according to their age

Age categories	Tomato farmers		Mean	SD
	Number	%		
Young (20-35 years)	46	46	39.32	11.511
Middle (35-50 years)	37	37		
old (Above 50 years)	17	17		
Total	100	100		

Source: Field survey.

Table 1: demonstrates that age of the Tomato farmers ranged from 20 to above 50 years, with the mean of 39.32 years and the standard deviation 11.511. Tomato farmers were classified into three categories on the basis of their age. Young farmers are mostly engaged in Tomato cultivation.

Table 2: Distribution of the Tomato farmers according to their education

Education categories	Tomato farmers		Mean	SD
	Number	%		
Illiterate	27	27	1.46	1.267
Primary	31	31		
secondary	20	20		
Higher secondary	22	22		
Total	100	100		

Source: Field survey.

Table 2: depicts that maximum farmers (31 %) have primary education while illiterate (27%) and secondary have (20%).Farmers having higher secondary education are (22 %). Tomato farmers were classified into four categories on the basis of their education along with the mean of 1.46 and the standard deviation 1.267. Farmers having primary are generally pursued in Tomato cultivation.

Table 3: Distribution of the Tomato farmers according to their Family size

Family size	Tomato farmers		Mean	SD
	Number	%		
Small (1-4)	31	31	5.62	2.196
Medium (5-6)	41	41		
Large (above 7)	28	28		
Total	100	100		

Source: Field survey.

In Table 3: Family size of the Tomato farmers of the study ranged from 1 to above 7 persons, with an average of 5.62

persons and standard deviation 2.196. Tomato farmers were classified into three categories because of their family size. Tomato farmers inducing medium family size (41%) are interest group in Tomato cultivation.

Table 4: Distribution of the Tomato farmers according to their Farm size

Family size	Tomato farmers		Mean	SD
	Number	%		
Small(0.01-0.33 acre)	83	83	1.23	.5478
Medium(0.34-1.0 acre)	11	11		
Large (above 7 acre)	06	06		
Total	100	100		

Source: Field survey.

Table 4: describes that Tomato farmers were classified into three categories due to their farm size. Maximum Tomato farmers are belonging to small farm (83 %) with the mean of 1.23 acre and the standard deviation 0.5478.

Table 5: Per acre cost of Tomato cultivation in the study areas

Cost Head	Small Farmer	Medium Farmer	Large Farmer	Total
Land preparation	41298	17760	33176	92234
Seed Cost	23614	10155	18970	52739
Cow dung Cost	6557	2820	5268	14645
Fertilizer(Urea/TSP/MP/Gypsum/Borax)	66882	28763	53728	149373
Labor Cost	118016	50753	94806	263575
Insecticides/Pesticides	20719	8910	16644	46273
Irrigation	10464	4500	8406	23370
Total variable cost	287550	123660	230997	642207
Land value	209280	90000	168120	467400
Total fixed cost	209280	90000	168120	467400
Total cost=(Variable + Fixed) cost	496830	213660	399117	1109607

Source: Field survey

*The above table is Figured in Units BDT Taka (Currency of Bangladesh with 1USD = 80.40 BDT)

In the table 5: Per acre Cost of Tomato cultivation of Small, Medium and large farmers are exposed. Total variable cost include Total cost was the summation of total variable cost

and total fixed cost. Total cost was highest for small farmers (TK. 496830) followed by large farmers (TK. 399117) and medium farmers (TK. 213660).

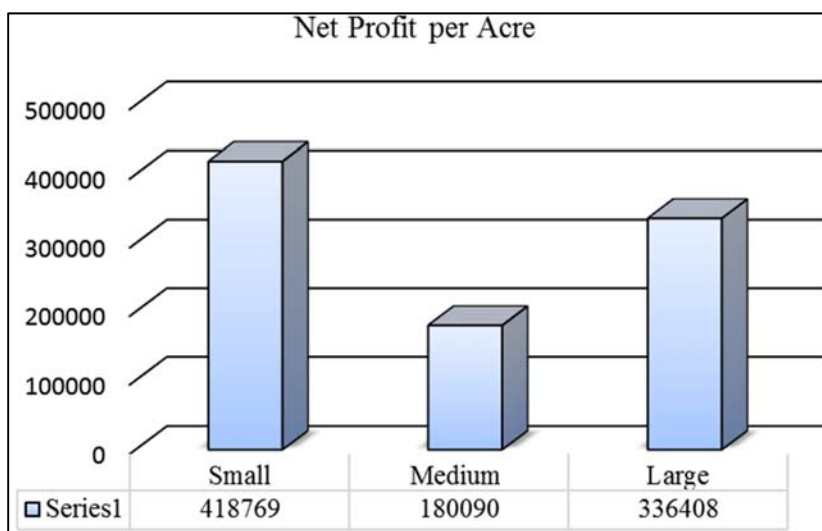
Table 6: Per acre Profitability and Benefit Cost Ratio of Tomato cultivation in the study areas

Item	Small Farmer	Medium Farmer	Large Farmer	Total
Total land use (acre)	17.44	7.5	14.01	38.95
Tomato Output (mound)	1308	562.5	1050.75	2921.25
Tomato TK per 40 kg	700	700	700	2100
Total revenue	915600	393750	735525	2044875
Total cost	496830	213660	399117	1109607
Net profit	418769	180090	336408	935267
Benefit Cost Ratio= $\frac{\text{Total Revenue}}{\text{Total Cost}}$	1.84	1.84	1.84	1.84

*The above Table is Figured in mound (1 mound = 40 kg)

Table 6: points out that Productivity is highest for small farmer (1308 mound) followed by large farmer (1050.75 mound) and medium farmer (562.5 mound). Profitability is also highest for small farmers (TK. 418769) followed by

large farmer (TK. 333608) and medium farmer (TK. 180090). Because most of the small farmer has more land as well as more output.



Source: Field survey.

Fig 1: Per acre net profit of Tomato cultivation in the study areas

Table 7: Correlations

	Correlations						
	Seed & planting cost	Weeding & Irrigation related cost	Pesticide Cost	Fertilizer cost	Labor of plantation & cost and purchase of seedling cost	Total production	Insecticide Cost
Seed & planting cost	1						
Weeding & Irrigation related cost	.490**	1					
Pesticide Cost	.181	.203*	1				
Fertilizer cost	.450**	.934**	.290**	1			
Labor of plantation & cost and purchase of seedling cost	.517**	.863**	.244*	.855**	1		
Total production	.493**	.861**	.210*	.889**	.777**	1	
Insecticide Cost	.373**	.347**	.284**	.373**	.457**	.346**	1

** Correlation is significant at the 0.01 level (2-tailed).

*Correlation is significant at the 0.05 level (2-tailed).

Source: Field survey

1. There is a significant positive correlation between Fertilizer cost and Weeding & Irrigation related cost. Because when weed increase, Farmers need more fertilizer for better output.
2. There is significant positive correlation between Fertilizer cost and Labor of plantation & cost and purchase of seedling cost. Since the Farmers use better seed for more output desire amount of output, therefore

they provide better Fertilizer. As a result, Fertilizer cost increase.

3. There is significant positive correlation between Weeding & Irrigation related cost and total cost. Since the land value increases, Farmers wants to maximize profit by getting best output providing sufficient Weeding & Irrigation. Consequently total production increase.
4. There is significant positive correlation between fertilizer cost and total production. As fertilizer increase production, so total production increases when fertilizer cost increases.
5. There is significant positive correlation between seed & planting cost and total production. Since Farmers want to produce more output desire amount of output, therefore they provide better seed. As a result, total production increase.

Problems

1. Low prices at peak harvest period
2. Damage caused by insects.
3. Unavailability of quality fertilizers in time.
4. Labor crisis
5. Unavailability of good quality seed
6. Lack of Government attention.
7. Farmers did not get proper price due to improper marketing channel/system.
8. Lack of farmers' knowledge on good quality seed and access to the seed.
9. Lack of linkage between farmers and exporter
10. Lack of coordination among research organizations like BARI, DAE and farmers and Agro/ Tomato processing companies.

Recommendations

Some recommendations are given below:

1. The price of Tomato should be readjusted from time to time safeguarding justice to the growers of Tomato.
2. Government should reduce the pesticide and insecticide price.
3. The consciousness of the farmers needs to be increased. They may be delivered adequate training so that they can produce Tomato appropriately.
4. Modern technology should be taking on for superior labor cost control.
5. Agricultural credit facilities to be ensured easily.
6. Provision for the introduction of crop insurance should be introduced. Therefore, the risk of Tomato cultivation would be minimized and farmers will get more ensured environment to produced Tomato.
7. In the view of actual field experiences gained so far, it is accomplished that farmers did not get fertilizers at the government rate. So public interventions might be required for ensuring the reasonable price of fertilizers. Furthermore, farmers reported that they were suffered from adulterated fertilizers. Consequently, public initiative should be taken to maintain fertilizer quality.
8. Quality seeds of improved varieties in right quantity are recognized to be one of the key elements for enhancing agricultural production. Farmers also reported that they were suffered from seed adulteration. So the DAE and other related institutions should make improved seed available to the farmers and government should take initiatives to control adulteration of seeds.

Limitation of the study

1. The study was restricted to one Sub-district where Tomato production was intense. Three villages under that Sub-district were selected purposively. The study might be momentous outcome if it enclosed a number of Sub-district producing Tomato's.
2. Due to deficiency of time the study could not cover wide side areas for gathering obligatory information.
3. Some written records were asserted by the literate respondents, but maximum respondents had no written document. Therefore, the researcher had to depend solely on the memory of the respondents.
4. Respondents were very busy. A study that brings in interview of 100 farmers cannot conclude anything accurately and as such, it was based on miss information.
5. The largest part of the farmers in the study area contemplation that the investigator was a government officer. So, they originally hesitated to answer the questions relating to their income and expenditure. Some were afraid of imposition of new taxes.

Conclusions

The main reason behind cultivating Tomato is the far and wide detained observation that Tomato is emerging as a lucrative vegetable. Tomato is well thought-out as the most important vegetable crops and has more multipurpose usages in Bangladesh. High production of Tomato depends on the spreading out of HYV and hybrid variety of seed, improved management and timely supplying of inputs. The rate of taking up of modern technology and sustainability of Tomato production depend largely on its economic prosperity. The situation of Tomato production & its industry is extremely to a great extent competitive. The profits it begets and hope it will help to add tax in the national economy is an immense contribution.

The findings of the study that net profit per acre (TK. 24011). This research shows small farmers cultivate more land & earn highest net profit. Priority should be given to the development of such roads which link villages to the main roads and markets. Most of the farmers are illiterate. Dissemination of market information should be increased so that farmers can get fair price of the Tomato.

After farming of Tomato, total household income of rural people augmented appreciably which enabled them to spend more on the basic items such as food, education, clothing, health care and housing compared to before. Tomato also helps in ameliorating the nutritional status of the rural people. It designates that livelihood and standard of living of Tomato farmers enhanced to some extent. If modern inputs and production technology can be made available to the farmers in time, yield and production of Tomato may be augmented which can help the farmers to enlarge income and perk up livelihood conditions.

Government or no additional agency can the Tomato farmer can put down his hands on durable ready cash the instant his produce is inclined of nothing like a good number other crops which yield proceeds as and when the Production is prepared for sale. This pretends as a most important unifying force for the farmers.

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