Quality cereal seed in achieving sustainable development goals in Bangladesh: A review of perspectives on policy analysis

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Received on: 04/09/2019 Accepted on: 18/09/2019 Published on: 27/09/2019

ABSTRACT

The quality seed is one of the first and foremost prerequisites for a healthy and vigorous crop and considered as an important factor for increasing crop yield. However, in Bangladesh resource-poor farmers have limited access to use quality seeds. To attain food security of the increasing population, per unit area of crop production need to be increased and quality seed can play a vital role to overcome this complex sustainable development issue in Bangladesh. Without proper policy implementation for quality seed supply, it is very difficult to achieve food security and sustainable development goal. Therefore, the objective of this review paper is to identify the causes of inadequate supply of quality cereal seed in Bangladesh and the policy options are need to be revised to enhance the availability of quality cereal seed at an affordable price for farmers. This article is prepared based on secondary data sources, desk interview, consultation with line departments, information from the website, the questionnaire used in social media, etc. The related portion of integration of sustainable development goal (SDG) into the seven fifth-year plan (7th FYP) and other related policy documents were critically investigated to find out the gaps and causes which hinder the implementation in making quality cereal seeds available. Apart from these, higher officials who are somehow involved in the seed sector were also consulted. The stakeholder analysis was done to understand the influences and interest of the concerned stakeholders, the SWOT (Strengths, Weaknesses, Opportunities, and Threats) analysis was done to understand the external and internal impact, the PESTLE analysis was done to analyze the socioeconomic and political significance along with environmental, technological consequences and legal aspect of the proposed policy, and the impact analysis was done to find out the best policy intervention to ensure quality seed supply. Based on the different analysis it was found that the infrastructure and technical manpower in the public sector (BADC and SCA) has not been increased as expected, varieties developed by NARS except few are not according to farmers choice, required quantity of Breeder Seeds of desired varieties are not obtained from research institutes, lack of statistics on cultivable land of different crops and marketing seeds by the private sector, absence of seed demand assessment/forecasting mechanism, injudicious and high seed price become unaffordable to the farmers, contract growers don't get their seed price in time, SCA has the regulatory functions to control seed quality but due to less capacity it can't carry out functions duly, and no appropriate seed production and marketing plan are the main causes of inadequate supply of quality seed. Recommended priority wise policy options to enhance the availability of quality cereal seed are strengthening BADC and SCA, facilitating private seed sector, subsidy/more budget allocation, updating statistics on arable land and seed, appropriate seed production and marketing plan, modernizing seed marketing with judicious pricing of seed, and amendment of seed policy and application of seed law.

Key-words: Private sector, quality seed, seed policy, seed pricing and sustainable development goals

Introduction

The quality seed is considered as an important factor for increasing crop yield. It helps greatly in higher production per unit area to attain food security. Now, it is a complex sustainable development issue in Bangladesh. Among the cereal crops, rice is the staple food in Bangladesh and contributing calorie intake over 65 percent of the country people [1]. Crop yields in the country need to be increased by 15-20 percent through the use of quality seed keeping other factors constant to meet the demand of increasing population [2].Farmer participatory experiments carried out in the Philippines and Bangladesh showed that good quality seed can increase rice yield by 8 to 10 percent [3].

Compared to other countries, the yield gap is higher for most of the crops in Bangladesh [4] and inadequate supply of quality cereal seeds is one of the important limiting factors for lower yield [5]. Currently, only 46 percent of farmers can use quality seed and the rest 54 percent depends on poor quality seed [6]. The public and private organizations supplied 60 percent of the total requirement of the quality

Citation as: Hossain MS and Ahmed S (2019). Quality cereal seed in achieving sustainable development goals in Bangladesh: A review of perspectives on policy analysis. J. Agri. Res. Adv. 01(03):01-11.

cereal seeds of rice, wheat, and maize (Figure.1) and rest of the 40 percent are produced traditionally by the farmers, which is known as an informal seed and considered as below standard [7].

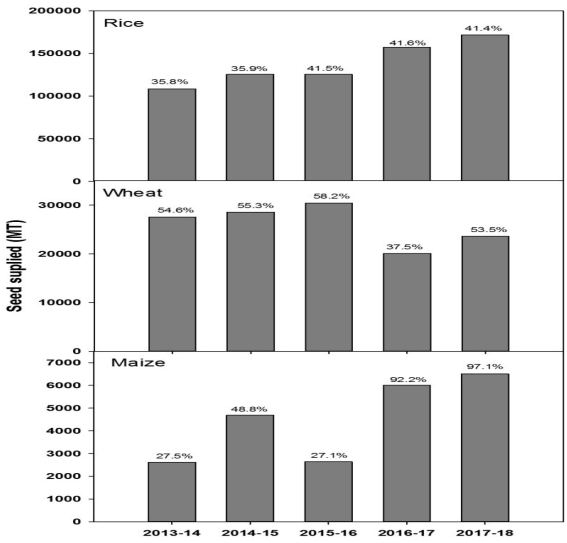


Fig. 1. Seed supplied of rice, wheat, and maize by the formal system against demand in 2013-14, 2014-15, 2015-16, 2016-17, and 2017-18 year.

Seed supplied by the BADC, private sector (PS) and NGO's are considered of formal seeds. The BADC and private sector receive Breeder Seed from agricultural research institutes and produce foundation seed from the Breeder Seed in its seed multiplication farm and Certified Seed from the Foundation Seed in contract growers fields following the certification procedure are known as formal seeds. A portion of formal seed like hybrid seeds of rice and maize are imported by private seed companies. Another important source of seed is the "informal" seed which farmers keep a part of their produce as seed and use it traditionally for subsequent crop production [8]. These seeds are never being subjected to apply any quality test and seed production procedure. National seed strategy systems should find ways to strengthen the informal seed system along with the formal system for sustainable seed supply in the country.

Although the net cropped area is decreasing in Bangladesh, the total cropped area is increasing with the increase of crop intensity. The cultivable land under three major cereal crops (rice, wheat, and maize) was 120.95 lac hectares and the cropping intensity was 215% in the 2017-18 year [9]. The intensive rice cultivation is now dominating in crop production systems and in boro season, 75% of the area is covered by the HYV and 21% is hybrid rice varieties. In aman, about 73% area is used for HYV and 27% for local varieties. Wheat covers 3.70 lac ha. area and Maize area is increasing gradually and now it has become an important cereal in term of yield (Anonymous, 2018). To cultivate the land under the said crops around 3, 33,120 MT of cereal seed is required but the supplied quantity of quality seed against the requirement is only 2, 01,794 MT [7]. Hybrid rice seed accounts for around 3.5 percent of the total seed requirement.

According to the UN projection, Bangladesh' population will further increase to 186 and 202 million (Table 1) by the year 2030 and 2050, respectively [10]. If the total cultivable land will remain more or less static, Bangladesh will have to support 182.3 million peoples by 2025 [7]. Therefore, there is a tremendous scarcity of good quality formal seed in the country. Long term planning for food security is urgently necessary with the context of the existing trend of population growth. To ensure food availability for the increasing population, an adequate quantity of quality cereal seed supply is a must. Failure of the government to ensure the supply of quality cereal seeds will result in low productivity, unemployment, poor economic growth which will ultimately reflect the poor GDP.

Table 1. Population and cereal demands (per capita and total)

Projection	Population (million)	Per capita demand (kg)			Annual national demand (M. Ton)			
		Rice	Wheat	Maize	Rice	Wheat	Maize	All grains
2010	151	170.5	25.9	9.9	25.76	3.91	1.50	30.05
2030	185	162.7	29.6	12.5	30.11	5.47	2.31	36.30
2050	202	145.8	34.7	14.0	29.45	7.01	2.83	37.26

Currently, the BADC is supplying 33 percent of the total required cereal seed (rice, wheat, and maize). The department of agricultural extension (DAE) started producing seeds under a project although the produced seeds are kept in farmer's house; hence there is

no control of the government over the seed. Rice seed supplied by private sector still quite low but maize seed supply is encouraging. The private seed sector has increased the availability of seeds to the commercial farmers, but their implication for quality seeds and ability to meet seed requirement of the small farmers are seen uncertain. It is an urgent need to balance responsibilities between the public and private sector so that the need for quality cereal seed is fulfilled at a reasonable price.

The productivity will not increase if poor quality seeds are replaced by the quality ones. Since the quality of farmers saved seed is poor, the availability of quality seed will not only improve seed replacement rate but also help to save of seeds by using a lower rate of seed per unit area. Once the farmers get the seeds of a high yielding variety from the seed organizations, they cultivate it, produce seed and store for reuse in the next season. Most of them rarely come for replacement of the seed stock until the yield potential of that cultivar declined remarkably. If the availability of quality cereal seed is not ensured the food supply for the growing population will be at high risk. Therefore, ensuring quality cereal seed is urgent in Bangladesh to reach sustainable development goal and to establish a sustainable agricultural nation.

The objectives of this review paper are to identify the problems of quality cereal seed supply and the policy options are need to be revised to enhance the availability of quality cereal seed at affordable price.

Methods and Materials

This review paper is prepared based on the literature review, secondary data sources, desk interview, consultation with line departments, information from the website, the questionnaire used in social media, etc. Data was also collected from various secondary sources including published books, journals, periodicals, reports, and articles. Besides a related portion of SDG, 7th FYP and other related policy documents were investigated to find out the gaps and causes which hinder the implementation in making quality cereal seeds available. Apart from these, officials who are somehow involved in the seed sector were also consulted. The stakeholder analysis was done to understand the influences and interest of the concerned stakeholders. SWOT (Strengths, Weaknesses Opportunities, and Threats) analysis was done to understand the external and internal impact. PESTLE analysis was done to analyze the socioeconomic and political significance along with environmental, technological consequences and legal aspect of the proposed policy. The impact analysis was done to find out the best policy intervention to ensure quality seed supply.

Results and Discussion:

1. Structure, capacity, functioning and quality control mechanism of the seed sector

1.1 Public seed agencies and infrastructure in Bangladesh

1.1.1. Seed Wing under the Ministry of Agriculture (MoA)

The ministry of Agriculture looks after all the activities related to seeds through its seed wing, preparing, adopting and administrating policies, acts, rules and regulations related to seed activities are the jobs undertaken by the ministry. Different statutory organizations and bodies such as the National Seed Board (NSB), Seed Certification Agency (SCA) are the implementing organizations of the seed legislation.

1.1.1a. National Seed Board (NSB)

The aim of the national seed board is to advise the government on matters arising out of the administration of this ordinance and to carry out the other functions assigned. NSB advises the government on different seed management activities such as the application of seed ordinance, rules, policy, variety release and registration, quality control, fixation of seed standards, etc. NSB has two committees: (1) Technical committee and 2) Seed promotion committee. Most specifically the committee is responsible to recommend the release of variety. The seed promotion committee is mostly responsible for promoting the use of the quality seed.

1.1.1b. Seed Certification Agency (SCA)

Seed Certification Agency (SCA) acts as the regulatory authority under the ministry of agriculture. It has a twelve-hectare control farm for Value for Cultivation and Use (VCU), Distinctness, Uniformity, and Stability (DUS), pre and post control and grow-out tests. The

Seed certification Agency certify seeds of any notified or other registered varieties and authorized for seed certification and variety release through field inspection, market monitoring, and seed quality testing.

1.1.2. Bangladesh Agricultural Development Corporation (BADC)

This is the sole public agency for multiplication, processing, preservation, and marketing of quality seeds. It is the largest seed producer and supplier in Bangladesh. It has established a system of seed multiplication of different crops by engagement of approximately 37,611 contract growers, 34 seed multiplication farms, 75 contract growing zones, 41 cold storage, 22 regional seed distribution center (for seed dealers), 52 seed processing and preservation center having 1,68,700 MT storing capacity, only 100 sale outlets at district and upazilla, 8056 registered seed dealers all over the country (Figure 2). BADC provides the facility to the seed growers, traders and farmers for processing and preservation of seed at minimum price to enhance to supply of quality seeds of different crops. Seed supplied by BADC used by farmers as a replacement seed stock for next year's production.

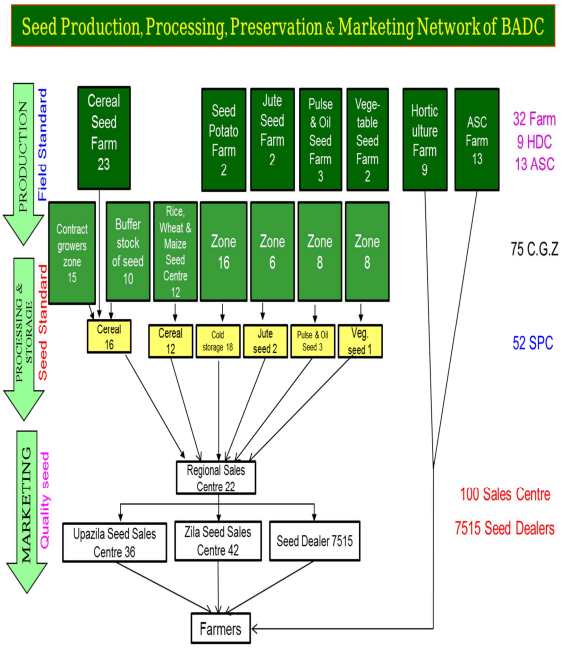


Fig 2. Seed production, processing, and marketing network of BADC

1.1.3. Department of Agricultural Extension (DAE)

Plant protection wing under DAE is responsible for the implementation of the plant quarantine services. It also issues import and export permits and phytosanitary certificates for importing and exporting plants and planting materials as per plant quarantine Act. DAE is also producing seed through a project but it has no seed processing and preservation facilities of its own.

1.1.4. National Agricultural Research System (NARS)

The different research organizations forming the national agricultural research system (NARS) coordinated by the Bangladesh Agricultural Research Council (BARC). Research organizations like BRRI, BARI, BINA are mandated to generate technologies including new varieties of cereal seed (Breeder Seed) and provide the seed to BADC and private for multiplication.

1.2. Private seed agencies and infrastructure in Bangladesh

A large number of private seed companies, NGOs together with a few multinational companies doing seed business. About 20 seed companies have seed production, processing, packaging, and storage facility and skilled manpower. A number of seed companies have developed seed marketing network through seed dealers but in most cases, they use BADC seed dealers in their seed marketing network. Besides, the private sector developed a good number of crop varieties. After the adoption of the national seed policy in 1993, the emerging private seed sector and NGO's have been playing an increasing role in the seed production and supply.

The emerging private seed sector includes national, multinational seed companies and NGOs like, McDonald, Syngenta Bangladesh Ltd., Bayer Crop science Ltd., Lal Teer seed company Ltd., Supreme seed company Ltd., Getco Agro Vision Ltd., Petrochem Bangladesh Ltd., Partex Agro Ltd., Metal Seed Ltd., ACI Seed, Aftab Seed Ltd., Ispahani Agro Ltd., BRAC, Proshika, TMSS, RDRS etc.

Bangladesh Seed Association (BSA) is a registered organization formed by the seed merchants who are engaged mostly in procuring seed from home and abroad and marketing. It has more than 200 registered members.

2. Quality Assurance Mechanism

The seed has been classified into four classes such as Breeder Seed, Foundation Seed, Certified Seed and Truthfully Labeled Seed for the purpose of controlling the quality of the seed. Breeder Seed is developed and multiplied by the plant breeders and is the first source of seed increase. Foundation seed shall be the progeny of Breeder Seed and Certified Seed shall be the progeny of Foundation Seed, provided this reproduction may not exceed three generations and that the genetic identity and purity are not significantly altered. Truthfully Labeled Seed (TLS) shall be the progeny of Foundation or Certified seed. Production of TLS is allowed by the National Seed Board (NSB) considering the necessity to maintain adequate seeds supplies.

The planting value and market price of the seeds can be measured only through the quality assessment of a seed lot. The major attributes that are in practical use are purity, germination and moisture content of the seeds. Genetic purity and seed health are important parameters to be included in the quality assurance of the seeds to be supplied to the farmers for crop production. The quality control mechanism is implemented by the National Seed Board (NSB) through the government organizations and some committees and or agencies. The quality assurance mechanism includes Seed Certification, Field Inspection, and Market Monitoring.

3. Policy and regulations dealing with seed

The quality control mechanism, export, and import management and marketing and distribution system for seed of the crops grown in Bangladesh are implemented by the seed related regulatory frameworks such as a) The seed ordinance, 1977; b) The seeds (Amendment) Act, 1997; c) The seeds (Amendment) Act, 2005; d) The national seed policy, 1993; e) The seed rules, 1998.

The seed Rules, 1998 elaborates the role and functions of the National Seed Board (NSB) and the procedures for registration of seed dealers, registration of varieties and labeling of the seed inspectors are highlighted. The seed rules also describe in more detail the seed regulatory framework and stipulate the forms and procedures in relation to an application for variety registration, field inspection, seed notification, and market control.

4. Policy Intervention

The National Seed Policy and other regulatory documents contain explicit guidelines and directions for increasing production of quality seed, but many of those are unattended still. The seed wing of BADC and the SCA has not been strengthened as per expectation. NGOs and private sector enterprises cannot yet utilize processing and storage facilities of BADC during peak periods because BADC itself is plagued with a shortage of laboratory, processing and storage facilities. Simplification of import procedures for seeds has not been adequate. Training and technical support to all concerned with quality seed production, processing, storage, and use have not been extended. Monitoring, quality control, and regulatory system have not been improved significantly.

Seed Policy was liberalized and implemented Seed Rules after 1998 for which private sector/NGOs got the right to involve directly in the seed activities of the country. The main purpose of this policy intervention was to help to reach the quality seed to the end users in more quantity with a faster way. All the small and big companies possessed a common license from the seed wing, MoA through which they have access to breeder seed without any restriction in the rules. Many of the organizations/companies are receiving Breeder Seed from BRRI/BARI but many of the seed producers have nothing except dealership license from MoA. Originally they are seed traders but now interested in seed production. There is no indication at the policy level if any farmers are cheated using bad quality seed from any producers and farmers have no scope to get compensation. Monitoring mechanism for seed quality should be incorporated as an amendment in the seed rules.

Although in the seed policy BADC has been instructed to phase out production of improved seeds and concentrate on the production of foundation seeds to support the program of the private sector but there is no time frame of phasing out and how the private sector will provide the required quantity of seed to the farmers is not stated. BADC should

produce Foundation, Certified and TLS of all important crops.

5. Analyses for seed supply problem define and context of problem understanding

5.1.Problem Tree Analysis

Summarizing all the factors affecting the availability of quality cereal seeds the self-explained problem tree is designed (Figure 3).

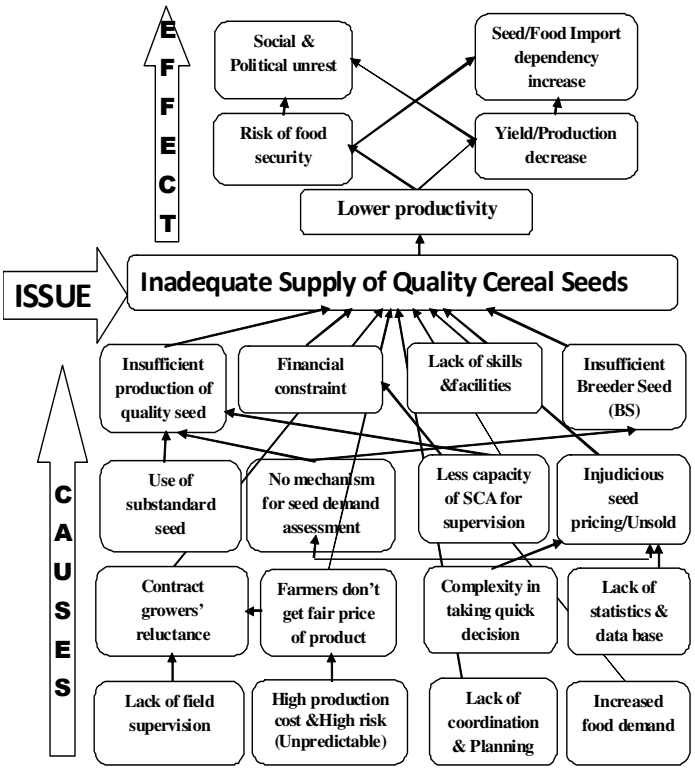


Fig 3. The factors affecting the availability of quality cereal seeds and their effects on food security (problem tree analysis)

Causes of inadequate supply of quality seed consolidated from Problem Tree:

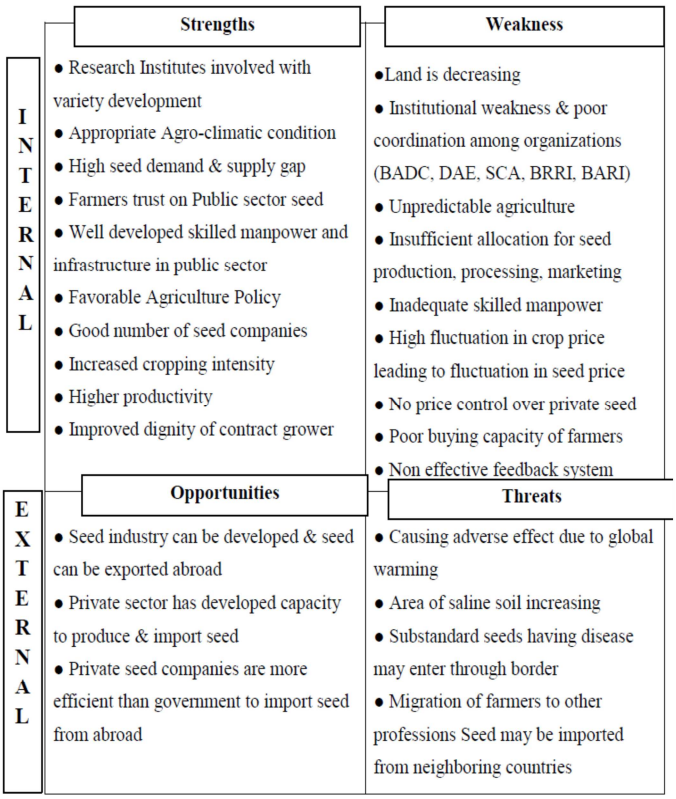
1. With the increasing demand for quality seed, the infrastructure and technical manpower in the public sector (BADC and SCA) have not been increased as expected. Presently manpower of BADC seed wing is straight half than that of sanctioned posts.
2. Except a few, most of the varieties developed by NARS are not according to farmers choice. Besides the required quantity of Breeder Seeds of desired varieties are not obtained from research institutes. Without a sufficient quantity of Breeder Seeds of desired varieties seed multiplication program can't be taken.
3. Lack of statistics on cultivable land under different crops and marketed seeds by the private sector.
4. Absence of seed demand assessment/forecasting mechanism.
5. Injudicious and high seed price become unaffordable to the farmers.
6. Contract growers don't get their seed price in time. They usually get seed price one year after seed received by BADC but not paid at the current year's market price that makes them reluctant to seed production.
7. SCA has the regulatory functions to control seed quality but due to less capacity, it can't carry out functions duly.
8. No appropriate seed production and marketing plan

5.2. Stakeholders Analysis

Table 2. List of Stakeholders and their main concerned

Stakeholders	Categorized by group	Main concerned
MoA-BADC/ Law enforcing agencies/ other ministries	Ministries and Agencies	They play the main role as govt. level policy actors. How much works the govt. do?
-Member of Parliament -Upazilla/UP chairman -UP Chairman and Member	Public representatives	Their concern is to attract voters or gain popularity
SCA, DAE, BARI, BRRI, BINA, BJMC, University	Public sector organizations	Whether the mandate or objectives of the organization is hampered or achieved
-Seed dealers -Seed traders -Seed companies/NGOs -Food/seed importers	Business group	Their concern is whether they will be economically benefitted or affected
-Farmers (male and female) -Seed producers (non- formal) -Seed producer	Consumer and producer groups	They are directly affected by the policy
-Seed Dealers Association - Journalist Association/Media	Professional interest group	Group interest and coverage in media

5.3. *Swot analysis*



5.4. Policy development and proposed options

Considering the findings of a review of literature, problem tree, Stakeholder analysis, SWOT analysis, seed demand, supply and import statistics it is obvious that existing quantity of quality cereal seed supply is lower compared to the requirement. Public sector (BADC and DAE) and private sector (seed companies and NGOs) are producing seeds following formal seed production procedures and the remaining huge quantity of seed produced by the farmer is not known. The private sector mainly imports hybrid maize and vegetable seeds from abroad. Due to unavailable of quality cereal seed farmers are compelled to use their won kept low-quality seed leading to low productivity. With the increasing trend of population and decreasing trend of arable land, yield, and productivity to be increased with making available quality seeds to the farmers. Considering those, policies have to be taken to enhance production of quality seeds through strengthening BADC (infrastructure and manpower), encouraging private sector with more access to public sector facilities, more allocation in budget or providing subsidies to make seed price affordable, updating statistics on crop-wise arable land and database on seed production and supply both in public and private sector, prepare a seed production and marketing plan (long, mid, short term) and implement accordingly, modernizing seed marketing system with Judicious pricing of seed and adopting policy amendment and stringent application of the existing laws.

5.5. PESTLE analysis

PESTLE analysis is done to find out different factors which are associated with the discussed problems.

Criteria Options	Political feasibility	Economic feasibility	Admin. feasibility	Social Impact	Technological	Legal	Environmental	Score
Strengthening BADC and SCA	+	+	+	+	+	+/-	+/-	5+
Facilitate private seed sector	+	+	+/-	-	-	+	+	4+
Subsidy/more budget allocation	-	+	+/-	+	+/-	+/-	+/-	2+
Updating statistics on seed	-	+	+/-	-	-	+	+	3+
Seed production and marketing plan	+	+	+/-	+	+	+	+	6+
Modernizing seed marketing with Judicious pricing of seed	+	+	+/-	+	-	+/-	+	4+
Amendment of seed policy and application of seed law	+/-	+	-	+	-	+	+	3+

NB: Here, Negative or minus (-) sign means it is hard/impossible/undesirable aspect. The positive or plus (+) sign means it is easy/possible/desirable for a particular aspect. Plus/minus (+/-) means it is not clear that the option easy/possible or not for a particular aspect

5.6 Impact of possible actions

Criteria Options	Political	Economic	Social	Technological	Legal	Environ mental
Strengthening BADC and SCA	Political gain	Revenue and Employment opportunity Increased	Suitable and appreciable	Mechanization increased	No legal improvement	No negative effect
Facilitate private sector	No impact	Overall supply of quality seed increased	No distinct impact	Mechanization increased	No legal improvement	No negative effect
Subsidy/more budget for seed	Political gain	More quality seed supply	No distinct impact	Technological facilities increased	No legal improvement	No negative effect
Updating statistics on seed	No negative effect	Assist in production planning	No distinct impact	No impact	No legal improvement	No negative effect
Seed production and marketing plan	No negative effect	Positive impact	Positive impact	No negative impact	No legal improvement	No negative effect
Modernizing marketing with judicious seed pricing	No impact	Positive impact	Farmers friendly approach	Technological facilities increased	No legal improvement	No negative effect
Seed policy amendment/ application of seed law	Political gain achieved	Positive impact	Positive impact	No impact	Positive impact	No negative effect

5.7 Risk analysis of the policy options

Options	**Risk Factor**	**Rank**	**Monitoring and Evaluation**	**Duration of Implementation**
Strengthening BADC and SCA	Budget allocation, time-consuming	Medium	Follow up meeting	Long Term
Facilitating private sector	Budget allocation, time-consuming	Low	Follow up meeting, Progress Report	Medium
Subsidy/more budget for seed	Budget allocation, corruption, misappropriation of fund	High	Follow up meeting, Progress Report	Short Term (Regular basis)
Updating statistics on seed	Budget allocation, skilled manpower, and updated data	Medium	Follow up meeting	Medium Term
Seed production& marketing plan	Experienced manpower, budget allocation,	High	Follow up meeting, Demand assessment	Short Term
Modernizing marketing system with Judicious seed pricing	Experienced manpower, budget allocation, survey	High	Follow up meeting, Demand assessment	Medium Term
Seed policy amendment/application of seed law	Coordination, timely decision	Low	Follow up meeting	Long Term

6. Recommended priority wise policy options and their significance

6.1. Strengthening BADC and SCA

In the seed policy, it is mentioned that BADC will concentrate primarily and producing foundation seeds of rice, wheat, jute, potato on its own farms. BADC will use farmers to multiply seeds on a contract basis and will gradually cause to grow certified seed on its own seed farms. In the 7th 5-year plan (Annex-1) it was also mentioned that BADC will be further strengthened in order to ensure production of quality seed at all stages of its production-breeder, foundation and certified seed and encouraged the farmer to produce quality seed and farmer to farmer seed exchange. Presently it is providing around 33% of the total required quality cereal seed. Cereal Seed supply is mainly constraint by seed processing and preservation facilities. Without expanding seed processing, preservation, and marketing network meeting up increased demand for quality cereal seed not possible. At the same time seed quality monitoring and regulatory activities of SCA to be expanded through strengthening SCA.

6.2. Facilitating private seed sector

In the open market economy, the private sector should come up with quality seed in the competitive market. Since the private sector has very limited seed processing and preservation facilities, the seed policy emphasized using facilities of BADC with the view to increase quality seed supply. For this BADC's role will be reoriented to promote the development of the private sector seed industry by advising and training private seed producers. The option of facilitating private seed sector and strengthening BADC and SCA is interrelated. Private sectors seed men will be granted access to storage space, drying/sunning floor, dryers, cleaning and other related equipment and facilities that are in excess of BADC seed wing. Favorable policies, concessions, incentives, and support will be provided to promote private sector participation in the seed industry.

6.3. Subsidy/more budget allocation

Agriculture contributes greatly to the Bangladesh economy. Our agriculture is risky and unpredictable. Frequent natural calamities including pest and diseases, high labor cost, uncertainty in getting their product's cost, unavailable of quality seeds of desired varieties, etc. are making our farmers less interested in crop agricultural. Our farmers don't get the fair price of their product even production cost. In many cases, they purchase quality seeds from BADC by selling their product. If the market price of their product is low then they compelled to use their low-quality seed instead of formal seed due to high seed price. So it is required to reduce seed price so that our resource-poor farmers can afford easily and maintain agricultural productivity. For this government should give subsidy or increase budget allocation in the seed sector as a priority sector.

6.4. Updating statistics on arable land and seed

Realistic statistics is the base of any planning process, particularly agricultural planning. We mostly depend on BBS and AIS, DAE but there is controversy over statistics provided by the two organizations. In order to achieve the objectives of 7th FYP, development of national farmers' database has been emphasized. Use of cropping pattern is changing, cropping intensity is increasing, arable land is decreasing, the total cropped area is increasing but the updated statistics regarding these is not available. Even in BADC, there is no cell or committee for updating data on land use and seed. So it is urgently required to have an updated database with software for seed-related planning and activities.

6.5. Seed production and marketing plan

There is no long, medium, short term planning for seed production in the country. Traditionally on the basis of recommendation of seed promotion committee seed production program is taken by BADC. There are no studies, how much seed is required and how much seed will be produced by DAE and Private sector. There is hardly any market assessment, demand forecasting activities for seed production and marketing. Sometimes it is found that seed remains unsold and sometimes huge crisis, this might be due to lack of proper seed production and marketing planning. For proper agricultural development seed production and marketing, planning is important.

6.6. Modernizing seed marketing with judicious pricing of seed

Seed marketing system in the public sector, BADC is back dated. Seed allotment is done based on DAE demand. The packaging is primitive. Procedures for recruitment of seed dealers not followed accordingly. Incentives for seed dealers are not attractive. The seed buying procedure is not friendly rather troublesome. If seed remains unsold at the dealer's shop, there is no provision of taking back. Seed pricing is injudicious. There is hardly any scope of taking quick decision by concerned official's fore-allotment of seed in the shortest possible time. On the other hand, the private sector is a little bit advance in this case. Considering the situations seed marketing system should be modernized with judicious seed pricing.

6.7. Amendment of seed policy and application of seed law

The National Seed Policy is given guidelines and directions for increasing production of quality seed, but many of those are unattended still. The seed wing of BADC and the SCA has not been strengthened as per expectation. NGOs and private sector enterprises cannot yet utilize processing and storage facilities of BADC during peak periods because BADC itself is plagued with a shortage of facilities. Monitoring, quality control, and regulatory system have not been improved significantly. There is no indication at the policy level if any farmers are cheated using bad quality seed from any producers and farmers have no scope to get compensation. Monitoring mechanism for seed quality should be incorporated as an amendment in the seed rules. For those reasons amendment of see, the policy is required and stringent application of seed law to be done.

7. Resources for Implementation

7.1. Institutional Arrangements

There is no need to establish any new institutes or organizations regarding seed in Bangladesh. As per National Seed policy, activities of BADC will be reoriented with establishing updating database cell and modernizing seed marketing system, judicious seed pricing, etc. At the same time regulatory activities to be expanded through strengthening SCA. Creation of no additional post is required in BADC. Most of the options will be implemented if the approved and vacant post is recruited.

7.2. Financial Arrangement

Fiscal policy effects on the availability of quality seed particularly cereal seeds. Agricultural credit is a development resource which requires a strategy for its mobilization and allocation and the purposes for which it is used are issues within the overall fiscal policy. Tax holidays, rebates or exemptions are traditional means of encouraging the establishment of the seed industry in Bangladesh. The revenue budget of government will increase for appointed manpower at BADC and SCA. Although the Annual Development Project (ADP) allocations are there for agriculture sector but no allocation for seed subsector. Source of the fund will be rearranged from government, development partners.

Conclusions

Sustainable agriculture requires an available supply of quality seed particularly rice, wheat and maize seed among other inputs. Availability of quality cereal seed boosts food production but the policy should be to get higher output with minimum input. Almost all hybrid maize and hybrid rice seeds are being imported by the private sector since there is hardly any good variety developed by our scientists. Except these, we don't need to import any seed of cereal crops. The production and supply of quality seed should not be totally left to the private sector. They can be given responsibility for a specific quantity of the total required seed with some conditions. Policy support needed to make available quality cereal seed at an affordable price and in time. But the initiatives should be in a holistic approach, not a single initiative. Without a strong monitoring mechanism, all development activities could not be monitored properly and hence would not be ensured.

Acknowledgment

The authors would like to express sincere appreciation to Dr. Chowdhury Salah Ahmed, Associate Professor, Bangladesh Institute of Government and Management (BIGM) for his unwavering guidance and encouragement during writing this manuscript.

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