

Participatory Approach for Planning and Organizing Quality Seed Production in Fodder Maize cv. African Tall

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ABSTRACT

Seed is the most important input to harvest a good crop. The potential yield of any crop variety depends on the quality of the seed used for cultivation. Use of quality seeds alone can enhance the crop productivity by 15-20 per cent. One of the main reasons for low productivity of crops is non-availability of reliable quality seeds in the local markets. Most of the small and marginal farmers depend on farm saved seeds for sowing and part of it for next season which may not meet the quality aspects as expected for a seed which results in poor field stand, uneven performance and ultimately low yield. Despite implementation of the organized seed programme, there exists an alarming gap between the demand and supply of quality seeds. The immediate increase in the productivity and production can be achieved by distribution of high quantity of quality seeds of new and high yielding varieties. In this context, the concept of farmer's participatory seed production which advocates self-sufficiency in multiplication and distribution of quality seeds is getting momentum. The paper deals with the concept of participatory seed production at farmer's level under the guidance of NSC, KSSC, KMF, University and Private seed companies etc. In the present case, even though the maize being a cross pollinated crop, the farmers of Doddaballapur taluk of Bengaluru Rural have formed a 'Corn Growers Association' and produced genetically pure maize seed cv. African Tall either by growing single variety or by maintaining the isolation distance and contributing greatly towards fodder seed demand of farmers of Karnataka.

Keywords: Participatory seed production, Quality seed, Improved variety, Fodder seed production, Additional income

SEED production scenario in India has undergone several morphological changes after green revolution. The economic importance of genetically and physically pure seed of high yielding varieties and hybrids has been of late, receiving increased recognition. However, availability of quality seed of improved varieties and hybrids is grossly inadequate and is one of the major constraints for enhancing production and productivity (Manjunatha *et al.*, 2015 and Hajong, 2016). High volume-low value seeds, predominantly the farmers are using farm saved seeds resulting in about 80 per cent of the area sown with farm saved seeds of old and obsolete varieties. It is more so in major field crops as seed cost alone accounts for 50 per cent of the total cost of cultivation (Roy, 2012). During the last 10 years, a number of varieties / hybrids have been developed in different field crops which have shown 10-40 per cent

yield superiority over local cultivars. With the exception of high value-low volume seeds, the seed production of low-value high-volume crops is primarily left with public sector due to bulky nature, more investment on infrastructure and less remuneration (Roy, 2014).

Therefore, to boost the productivity of such low value-high volume crops, farmers need to have access to improved variety seeds of the right type, right time, right place and at a reasonable price. Then the concept of seed production through farmers in their field came into existence. Initially, progressive farmers with sufficient land, irrigation and labour resources identified were supplied with basic seed by the seed production organization and the seed is produced under the supervision of concerned scientists of the seed producing organization.

In the beginning of 20th century the quality seed production programme was extended even to small farmers. Farmers Participatory Seed Production in India is one of the few countries (Chowdhury *et al.*, 2010) where the seed sector has advanced in parallel with the agricultural productivity. However, the participation of the farmers in the seed production programme depends on the following factors.

Economic Factors

Seed production requires additional investments in terms of inputs like fertilizers, pesticides, irrigation, labour etc. compared to commercial crop production. Every farmer thinks and takes the decision judiciously in order to accrue the maximum benefits. Usually the seed crop fetches 15-20 per cent additional income over commercial / grain crop. At present central and state government supports the seed production activities of the farmers by extending subsidies, incentives etc. Most of the agriculture commodities including selling and procurement price of the seed is fixed in advance, except milk which is being sold through co-operative societies, which is not possible in any other agricultural produce, hitherto.

Psychological Factors

Psychology of any human being is that, he presumes that he is second to none, the seed growers are more knowledgeable than grain growers and acquires the production technology, harvesting and storage and further strongly feels proud that he is supplying the seed produced by him to the many other fellow farmers. He convinces the family and neighbourhood in taking up of seed production activities.

Social Factors

They are important in organizing any seed production programme. Generally seed production locations are identified in the country based on the soil, climate, irrigation resources and transportation facilities to the destination. The locally, existing organizations, MPCs, SHG's and Commodity groups are to be contacted to plan and elicit farmers participation in the seed production programme. For individual farmers who are

taking up seed production programme and supplying the seed produce to distant places for processing and packing is difficult. Therefore, many seed growers joined together to encourage and economise their activities through community approach in purchasing of basic seed, getting technical information, facilitating the field visits and transporting the seed produce to the destination.

Credibility of Seed Organization

The rapport and reputation of the organization in dealing with seed procurement from the producers, payment and maintenance of fair deals is very much necessitated, since a person who wants to interact/ deals with other person looks on his credibility. Being the case, investment of all his resources like land, labour, capital and time to take up the seed production, definitely depends on the credibility of the seed organization. In addition, whether the seed production organization is public/quasi government or private owned will make the difference in attracting the seed producing farmers.

Due respect and recognition should be given to the seed producing farmers since they are involved in all the activities of seed production. Therefore, the farmers should be recognized individually and in groups for encouraging them to devote some more time for maintenance of quality in seed production, to which they need to be supplied with adequate technical information on seed production along with basic seed in right time for producing enhanced quantity and quality seeds.

MATERIAL AND METHODS

Selection of Crop and Variety

The crop which is widely grown in the region and variety recommended for the agro-climatic zone having great demand for its seed must be selected for seed production (Narappa *et al.*, 2018). Only interested and resourceful farmers may be identified for seed production of improved varieties under the guidance of seed organizers. The farmer must be willing to devote a major portion of land for seed production.

Other criteria such as availability of assured irrigation source, suitability of soil have to be verified by visiting the field.

Planning and Implementation

After identifying the potential farmers of the ideal area for seed production, the organization has to enter into an agreement with the farmers society through local organizations followed by conducting group meetings with progressive farmers / farmers group to discuss about the crop variety to be taken up, season, seed production techniques and critical stages if any for adopting interventions to maximize the seed yield. If possible provide the farmers with simple literature about seed production. Conducting the training / method demonstration on seed treatment or such activities should be followed to educate the farmers. This strengthens the farmer's participation and confidence in the seed production activities. If possible farmers could be taken to nearby seed production plots and arrange the farmers to farmer discussion for better appreciation.

Field days should be organized when the crop is at right stage. Here the demonstration farmers must be allowed to speak on his crop and share his experiences with the audience, this technique of information dissemination is better than that of official's lectures during the field day. Sufficient publicity should be given about the success stories in local news paper. This will motivate the fellow farmers to involve in such activities. In addition, electronic media can also be utilized to publicize successful seed production programmes. The electronic media is supreme and can be visualized by the general farmers.

Maize is the most important world's leading cereal crop which can be grown in diverse seasons, ecologies and uses and known as queen of cereal due to unparallel productivity among cereal crops (Meena *et al.*, 2014). It is an important food / fodder crop grown world-wide, serving as food, livestock feed & fodder and provide industrial raw materials (Pandit *et al.*, 2016). Globally as a grain crop the area under this crop was 176 million ha with 875 m mt production, thus low in area and high in productivity as compared

to wheat and rice. In non-traditional areas it is largely replacing sorghum, as an important dual-purpose crop, the stover of which is highly valued for its quality fodder (Chaudhary *et al.*, 2016). Under the prevalent fodder shortage in India, maize stover would be a substitute for sorghum stover. Hence, utilization from maize crop can be enhanced by growing dual purpose maize i.e., grain/seed and stover purpose.

The farmers of Gundamgere, Hosalli, Harudi and nearby villages of Doddaballapur taluk, Bengaluru Rural district undertakes fodder maize cv. African tall seed production in an area of 15,000-20,000 acres every year. The maize cv. African tall is suitable for green fodder, having more dry matter, crude protein and more number of leaves/plant (Table 1). The crop is harvested at 60-75 days after sowing *i.e.*, when the cob is in the milky stage for fodder purpose. It is highly suitable for green fodder, silage, stacks, maize flour and etc.

TABLE 1
Morphological characteristics and fodder components of maize cv. African tall

Characters	Composition
Green fodder yield (t/ha)	42-45
Crude protein (%)	11-13
Dry matter (%)	17.65-18.20
Plant height (cm)	350-400
Number of leaves	13-15
Leaf length (cm)	81.30-85.00
Leaf breadth (cm)	8.15-8.20
Stem thickness (cm)	1.77-2.00
Leaf-stem ratio	0.21

For implementation of maize seed production, under Farmers' Participatory mode, villages with high potential of seed production were selected. The selected farmers were trained by the seed organizers for all aspects of seed production technology of the crop. During training, the farmers were supplied with reference material, the package of practices of the crop in local language. Then the farmers in each of the village discussed themselves and took-up seed production in association with the agencies like NSC, KSSC, KMF, University and Private seed companies.

They have also formed a ‘Corn Growers Association’ with the help of KVK, Bengaluru Rural district for facilitation of seed production programme.

Seed quality assurance is the utmost priority in this system of seed production involving farmers. The produced seeds are being certified by the Karnataka State Seed and Organic Certification Agency, Hebbal, Bengaluru only after satisfying the field and seed standard as per the specification of the Indian Minimum Seed Certification Standards (Table 2). Since the

TABLE 2
Indian minimum seed certification standards for maize

Particulars	FS	CS
Isolation (Field of other crop Vars. In m)	400	200
Isolation (Same Var. & Teosinte in m)	400	200
Off types (%)	1	1
Seed Standards		
Pure seed (%)	98	98
Inert matter (%)	2	2
Other crop seed/kg	5	10
Other variety seeds/kg	10	20
Weed seeds (Max)	0	0
Germination (Min %)	90	90
Moisture (Max %)	12	12

scientists are visiting (at pre-sowing, at the time of flowering and before harvesting) the villages regularly, the problems faced by the farmers were also addressed.

RESULTS AND DISCUSSION

Fodder Seed Scenario in India

Availability of quality seed in fodder crops to enhance production and productivity is long-felt need. The quality seed production is an important area that needs to be strengthened for vertical growth in cultivated fodder and horizontal growth in grassland and silvipasture sector. A multi-pronged strategic policy and research interventions are required to take care of all aspects of fodder seed production technology, quality,

seed standards, certification, distribution and marketing. Projected requirement (Table 3) of fodder seed at current level of cultivated area of 8.47 million hectares has been worked out at replacement ratio of 20 per cent.

TABLE 3
Fodder seed scenario in India

Seeds / Root slips	Fodder requirement over the years				
	2015-16	2016-17	2017-18	2018-19	2019-20
Seeds (q)	3596	4000	5400	5400	5400
Root Slips (in lakhs)	1100	400	400	400	400

Draw Backs of Fodder Seed Production

- In India, large area is sown using poor quality uncertified seed that gives poor fodder yield. Usually, farmers do not produce these seeds
- The main constraints for seed production are non-availability of quality seed in sufficient quantities
- Lack of irrigation area and other resources
- The seeds sold in local market are of poor quality

Therefore there is a need of substitute to ensure availability of quality seed of improved varieties at village level and integration of farmers in the seed production and supply systems to enable timely availability of quality seed at the door-step of farmers (Singh *et al.*, 2018 and Singh *et al.*, 2020). The immediate increase in the productivity and production of the crops can be achieved by a higher distribution of quality seeds of new and high yielding varieties. In this context, the concept of seed village which advocates village self-sufficiency in multiplication and distribution of quality seeds is getting momentum.

The establishment of local farmer organizations has facilitated seed production between farmers and seed organizers. The farmers will be trained and provided technical support and benefited much from the dissemination of high-yielding crop varieties in addition to other complementary technologies (Divya *et al.*, 2019).

In the present case, even though the maize being a cross pollinated crop, the farmers of Doddaballapur taluk of Bengaluru Rural have formed a ‘Corn Growers Association’ and produced genetically pure maize seed cv. African Tall either by growing single variety or by maintaining the isolation distance and contributing greatly towards fodder seed demand of farmers of Karnataka.

The seeds produced by the farmers under Farmers’ Participatory Seed Production and its comparative economics are given in Table 4 and Fig. 1 & 2.

TABLE 4

Comparative yield and economics of fodder maize seed variety and commercial variety under farmer’s participation

Particulars	Seed variety	Commercial variety
Average yield (q/acre)	18	18
Procurement price (Rs./q)	3100	1500
Gross return (Rs./acre)	57800.00	29000.00
Cost of cultivation (Rs./acre)	22121.50	20290.50
B:C Ratio	2.44	1.43

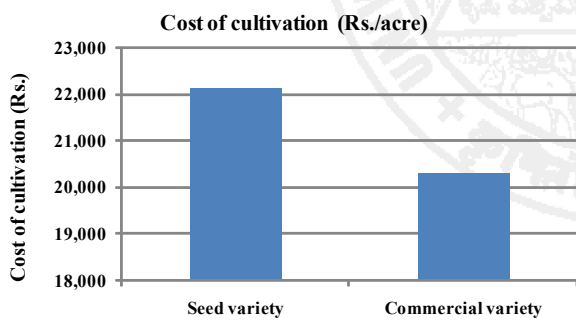


Fig. 1: Cost of cultivation of seed and commercial maize variety

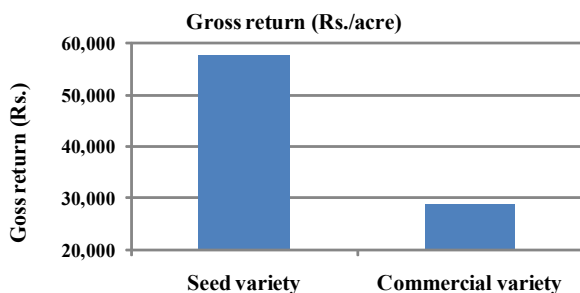


Fig. 2: Gross return of seed and commercial maize variety

Socio-Economic Implications

The Farmers’ Participatory Seed Production programme will enhance availability of quality seed which intern help in increasing SRR, which is one of the major objectives for enhanced production and

TABLE 5
Comparative economics of seed and grain production

Particulars	No. of units	Rs./acre	
		Seed variety	Commercial variety
Operational cost/acre			
Human Labour @ Rs. 280	20	5600.00	5600.00
Machine Power @ Rs. 400/h	6	2400.00	2400.00
Seed rate 6+1 kg @ Rs. 46/kg	-	322.00	276.00
Manures and Fertilizers			
FYM- 3t @ Rs. 1500/t	-	4500.00	4500.00
N : 40 kg/ha : Urea @ Rs. 6/kg	-	522.00	522.00
P ₂ O ₅ : 20 kg/ha : SSP @Rs.8.50/kg	-	1062.50	1062.50
K ₂ O : 10 kg/ha : MOP @ Rs.20/kg	-	340.00	340.00
Zinc Suphate: 4kg	-	200.00	200.00
Spreading of fertilizer and FYM @ Rs. 280	5	1400.00	1400.00
Irrigation Charges	5	1400.00	1400.00
Plant Protection	-	350.00	350.00
Chemicals (Seed treatment)	-	-	-
Harvesting and shelling	8	2240.00	2240.00
Cop sorting	4	1120.00	0.00
Miscellaneous	-	385.00	-
(Registration Rs. 35/-, Certification/inspection Rs. 200/- and testing Rs. 150/-)	-	-	-
Roughing operation	1	280.00	-
Rental Value of Owned Land			
Cost of cultivation	-	22121.50	20290.50
Returns	-	-	-
Main product (Good seed)	50	2200.00	27000.00
Rejected seed	-	1800.00	-
By-product	-	2000.00	2000.00
Gross income	-	54020.00	29000.00
Net Income	-	31898.50	8709.50
Benefit Cost Ratio	-	2.44	1.43

productivity. It also helps in increasing farmer's income and popularization of recently released varieties as well.

The programme generated employment opportunities for the rural youths, farm workers, farm women as seed production is skill oriented work. A huge number of farm workers and farm women are being involved in harvesting and post harvesting handling of seed produce *viz.*, seed processing, treating, bagging, storage, finally transporting and marketing. Thus, this programme strengthens the rural employment as unemployed rural youths will be engaged in seed production activities.

The farmers, other than the seed producer who involve in crop production of different crop varieties get higher yields/productivity as they have used quality seeds for raising the crop and intern get higher rate during selling of their produce as compared to the prevailing rate in the local markets. Whereas in case of participatory seed production programme, the producer is no need of worrying the market fluctuations as he is assured of buy-back of the seed produce at 10-15 per cent higher rate than the rate prevailing in the local markets (Table 5). Thus, the socio-economic status of the farmer will improve due to generation of additional income through seed production against commercial crop production. He derives more satisfaction by supplying the quality seeds to his fellow farmers. The additional income earned through seed production helping the farmers to start other enterprises and opening avenue for further development of farming community (Roy, 2014).

Conclusion: The participatory seed production in association with farmers in a village is the need of the day where good quality seed production may be made available at local level and caters the need of nearby villages. Successful seed production with the farmers will ensure only when the seed producer groups are formed. Presently, group approach will strengthen individual farmers which intern helps in fulfilling common demands. This system will also benefit the seed producing agency not only for timely distribution of seed, but also field visits, communicating with seed

growers and finally bringing the seed produce to the seed processing centre. Therefore, participatory seed production is highly practical approach and needs to be promoted to facilitate production and timely distribution of quality seeds of desired varieties at village level.

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