

VALUE CHAIN ANALYSIS OF 'SHRIJANA' TOMATO SEED IN NEPAL

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ABSTRACT

This study was conducted employing a sample survey of all the identified Shrijana tomato seed producers across the country including randomly selected commercial tomato vegetable farmers and Agrovets from Kathmandu valley, Kavre, Nuwakot, Dolakha, Kaski districts of Nepal in FY 2013/14. The sample survey was supplemented with a focus group discussion of tomato growing farmers in each of the study districts. The result showed an involvement of public and private sectors including non-governmental organizations (NGOs) and farmers groups in Shrijana seed production and supply in Nepal. The study revealed an increasing trend of production, supply and price of Shrijana tomato seed in Nepal. A total of 293 kg Shrijana seed having a value of around 47 million Nepalese rupees was produced by these actors in FY 2013/14. Private sector was the dominant actor sharing about 85% of the total Shrijana seed production in Nepal and about 95% of the total seed produced was consumed domestically while 5% was even exported to India. Agro-vets who act as a means of delivering seed to the farmers received about 17% to 25% marketing margin while selling Shrijana tomato seed. Producer's share was higher (66.6%) for farmers producing Shrijana seed in technical assistance of governmental organizations followed by seed producer farmers that were technical assisted by NGOs (53.3%) and farmers producing seed in contract with the private seed companies (26.7%) respectively. Majority of the sample vegetable tomato producing farmers shared their complaints on the flow of poor quality seed in the market due to which they had declining faith towards Shrijana variety. Concerns for improving the quality of parental lines were also raised by Shrijana seed producing actors. Therefore, emphasis should be placed on improving the quality production of Shrijana parental lines as well as hybrid seed. Focus should equally be given in capacity building and strengthening of value chain actors in ensuring access and quality use of the parental lines for the quality production and supply of Shrijana tomato seed in Nepal.

Key words: Marketing margin, Producer's Share, Seed quality, Shrijana tomato, Seed value chain

Introduction

Seed is key input for agricultural development (MoAD, 2013a). Use of quality seeds is important to increase crop productivity and income of small farmers (Gauchan et al., 2014). Vegetable seed is a promising sub-sector with potential to improve agricultural production, poverty reduction and food security (MoADa, 2013; CEAPRED, 2014). Vegetable seed are high-value and low-volume products and demand for improved and hybrid vegetable seeds are increasing every year in Nepal due to increasing trend of fresh vegetables production

both for main season and off-season (SCPL, 2011). Vegetable seed demand for 2013/14 was estimated to be 1,900 Metric Tons (MT) (SEAN, 2013) but domestic seed production meets only about 53% of the total seed demand and the rest is fulfilled mainly through its imports. The use of hybrid seeds is common in maize, rice, and vegetables mostly in the Terai and river valleys of the country. About 60% area of the commercial production pockets of vegetables is covered by hybrid vegetable seeds. Hybrid seed production of crops is limited to only few varieties of few crops in Nepal. The demand of hybrid seeds is therefore met by imports. Import of hybrid seed in vegetables and maize in Nepal was formally started by private sector since 1985 which now handles more than 90% of the formal vegetable seed trade and supplies significant amount of hybrid seeds of maize, rice, vegetables and other crops (MoAD, 2013a). Estimates show that hybrid seeds occupy about half of the total import by volume and two-third of the import by value (SEAN, 2013). The National Seed Vision-2025 recently formulated by the Government of Nepal (GoN) has put emphasis on self-sufficiency, import substitution and export promotion of quality seeds through domestic production and marketing. National Seed Vision has also emphasized to increase seed replacement rate of vegetables through increased investment in hybrid and high yielding variety development (MoADa, 2013). In addition, it has envisaged developing and promoting 30 hybrids (20 from public sector and 10 from the private sector) in vegetables to meet the growing domestic demand and to substitute the import of hybrid seeds in Nepal.

Tomato is one of the major vegetables grown widely in Nepal. It is cultivated in about 20,000 hectares (ha) and around 0.3 million MT tomato is produced annually in Nepal (MoAD, 2013b). Even though, tomato is best suited to the Terai, low and mid hills, it is also increasingly becoming attractive for cash generation in the high hills (Pandey & Chaudhary, 2004). Tomato is grown from subsistence to commercial scale in all type of production system, agro-ecological zones and development regions of Nepal. Until two decades ago, tomato was used to be grown only in the rainy season in the hills at subsistence level. However, the introduction of improved varieties has made possible to grow tomato in the spring season as well (Ghimire et. al., 2001). A large number of improved and hybrid varieties are available to farmers for growing tomato in Nepal. Until now, a total of four open pollinated varieties (OPVs) of tomato are released and one hybrid tomato variety is registered while 27 exotic hybrids (F1) are registered in the country (CPDD, 2014). 'Shrijana' is the only domestically developed hybrid tomato registered by National Seed Board with the effort of Nepal Agricultural Research Council (NARC) in 2010 (MoAD, 2013a). Shrijana hybrid tomato was developed by crossing HRD-1 (female line) and HRD-17 (male line) and is popular among farmers due to its wider adaptability, longer shelf-life, superior taste and size, as well as disease resistant characteristics. Shrijana tomato is particularly recommended to grow in the mid and high-hills inside plastic house (Chapagain et. al., 2011; Pokharel and Thakur, 2012). Shrijana tomato hybrid has also been identified as one of the potential crop varieties for import substitution and export promotion (MoADa, 2013). Since the formal registration of Shrijana variety, a number of actors (governmental, non-governmental and private sectors) have emerged and started its seed production in Nepal. Parent lines of 'Shrijana' tomato are maintained, and produced by the Horticulture Research Division, Khumaltar of NARC, and provided to other actors for producing 'Shrijana' hybrid seed. However, there is limited information on the actors involved in 'Shrijana' tomato seed production, and the scales, practices and constraints associated with its production and marketing in Nepal. Hence, this study was carried out with the objectives of identifying the

key actors involved in commercial production of 'Shrijana' tomato seed as well as analyzing the production, marketing and economic aspects of this hybrid variety. The information generated through this study is expected to be helpful in designing appropriate research and development programs and strengthening of 'Shrijana' tomato seed value chain in Nepal.

Methodology

Shrijana hybrid tomato seed is produced through the crossing of its male and female parent lines. Horticulture Research Division (HRD), Khumaltar of NARC is the main source of parent lines to the actors involved for Shrijana seed production. Some of the actors such as Gorkha Seed and Agro Traders Company (Gorkha Seed Company hereafter) and Agriculture Research Station (ARS), Malepatan, Kaski also maintain and use the parent lines themselves as well as provide it to other actors (farmers/farmers groups) for seed production. During this study, all the actors using the parent lines from these sources for Shrijana hybrid seed production was identified. A checklist and semi-structured interview schedule was prepared and primary data were generated through the sample survey of all the identified actors involved in production of Shrijana tomato seed across the country. Shrijana seed producers also supply the seed in the market mostly via their own channels which then reach to the consumers (tomato fresh vegetable producers). Based on the interaction with the actors involved in Shrijana tomato seed production, value chain maps were developed which helped to identify the flow of seed and actors involved in each stage (input supply and seed production to seed consumption) of the Shrijana tomato seed value chain. About 30 agro-vets involved in marketing of Shrijana seed and 30 farmers producing Shrijana tomato fresh vegetable were identified from major tomato seed and fresh vegetable production pockets of central and western regions covering Kathmandu valley, Kavre, Nuwakot, Dolakha, Kaski districts. Sample interviews were conducted with the randomly selected agro-vets and farmers from those districts. The sample survey was supplemented with focus group discussion of the farmers producing Shrijana tomato vegetables in each of the selected district. Secondary data on Shrijana tomato were also collected from the various published documents. Data analysis was carried out by using Statistical Package for Social Sciences (SPSS) and Microsoft Excel (MS-Excel) software.

Result and Discussions

Identification of value chain actors in Shrijana hybrid tomato seed production

A number of actors from the governmental, non-governmental and private sectors as well as a farmer's group had involvement in production of Shrijana seed in FY 2013/14 in Nepal. The major value chain actors and their mode of Shrijana hybrid tomato seed production is given in Table 1.

Majority of the actors involved in Shrijana seed production were from private sectors that mostly included private seed companies and Agro-vets. They were primarily producing Shrijana seed either in their own farm only (Gorkha Seed Company, Anamol Seed Company, Agroshala Nepal, Mero Agro Pvt. Ltd.) or in contract with the farmers (SEAN seed and Kasthamandap Trade Point). One of the non-governmental organizations (NGO), Center for Environmental and Agricultural Policy Research, Extension and Development (CEAPRED) had also involvement in Shrijana hybrid tomato seed production in Nepal. CEPARED under its third phase Vegetable Seed Program (VSP III) (2011-2014) provided

technical supports to the farmers/farmers groups and cooperatives in different districts for the production and marketing of Shrijana tomato seed. While from the governmental sector, HRD, Khumaltar has involvement in maintaining, producing and supplying parent lines for the actors producing Shrijana seed. Apart from that, HRD had also involvement in monitoring as well as capacity building of the stakeholders in Shrijana seed production. One of the NARC station namely Agriculture Research Station (ARS) Malepatan was also involved in producing Shrijana seed as well as providing technical support the farmers in Kaski and Syangja district for production and marketing of Shrijana seed. Similarly, Sub-tropical Vegetable Production Centre (SVPC), Rukum; a governmental farm center was also producing Shrijana seed in its own farm since 2012. A farmer's group Puspanjali Seed Producer Group, Lalitpur technically backstopped by HRD, Khumaltar started producing Shrijana tomato seed since 2014.

Table 1. Shrijana hybrid tomato seed producers and suppliers in Nepal

S.N.	Name of the Institution	Involvement since	Type of Institutions	Mode of production
1.	Grokha Seed and Agro Traders Company Limited, Kathmandu	2008	Private	Own farm
2.	SEAN Seed Service Center Limited, Kathmandu	2011	Private	Own farm and in contract with farmers
3.	Kasthamandap Trade Point, Kathmandu	2011	Private	in contract with farmers
4.	Agricultural Research Station (ARS), Malepatan, Kaski (Kaski and Syangja districts)	2011	Governmental	Own farm as well as through farmers
5.	CEAPRED (Kavre, Parbat, Rukum, Surkhet, Dailekh and Baitadi districts)	2011	Non-governmental	through farmers groups and cooperatives
6.	Sub-tropical Vegetable Production Centre (SVPC), Rukum	2012	Governmental	Own farm
7.	ANAMOL Seed Company Private Limited, Kaski	2013	Private	Own farm
8.	Agroshala Nepal, Kathmandu	2014	Private	Own farm
9.	Mero Agro Private Limited, Kathmandu	2014	Private	Own farm
10.	Puspanjali Seed Producer Group, Sunakothi-6, Lalitpur	2014	Farmers Group	Own farm
11.	Horticulture Research Division (HRD), Khumaltar, Lalitpur	2010	Governmental	Parent line maintenance, production and supply

Trend of production and price of Shrijana hybrid tomato seed

The study revealed an increasing trend of Shrijana hybrid tomato seed production and market price of seed in Nepal (Figure 1). Although Shrijana variety of tomato was formally registered in 2010, seed production of this variety started in FY 2007/08 through Gorkha Seed Company. This was possible due to the parallel involvement of same technical personnel both in HRD, Khumaltar and Gorkha Seed Company during the process of developing Shrijana hybrid tomato technology. With the formal registration of Shrijana hybrid tomato in 2010, other actors also gradually emerged and started commercial seed production of this variety. About 0.24 kg of Shrijana seed was produced by Gorkha Seed Company during FY 2007/08 and with the increasing demand of this variety by the farmers, the production and supply of its seed gradually increased over the years and reached to 293 kg in FY 2013/14. About 47 million Nepalese rupees was estimated by the production and marketing of Shrijana seed in FY 2013/14 in Nepal. Similarly, the study revealed a gradual increase in the price of Shrijana tomato seed over the years. During the initial year of Shrijana seed production (FY 2007/08), the price per kilogram (kg) of Shrijana seed was about 80,000 Nepalese rupees (NRs.) which gradually increased over the years and reached to around NRs. 160,000/kg during FY 2013/14 in the market. The price for Shrijana seed produced by the various seed producers was however not uniform. The retailing price for Shrijana seed produced and supplied by Gorkha Seed Company was the highest (NRs. 175,000/kg) followed by Agroshala Seed Company (NRs. 165,000/kg), and Anamol Seed Company (NRs. 162,500/kg) in the market respectively in FY 2013/14. There was similar price (NRs. 150,000/kg) for Shrijana seed produced and supplied by SEAN Seed Company, Mero Agro Limited, Kasthamandap Trade Point. While the seed produced by ARS, Malepatan, CEAPRED, SVPC-Rukum and Puspanjali Farmers Group was sold at a price of around NRs. 100,000/kg.

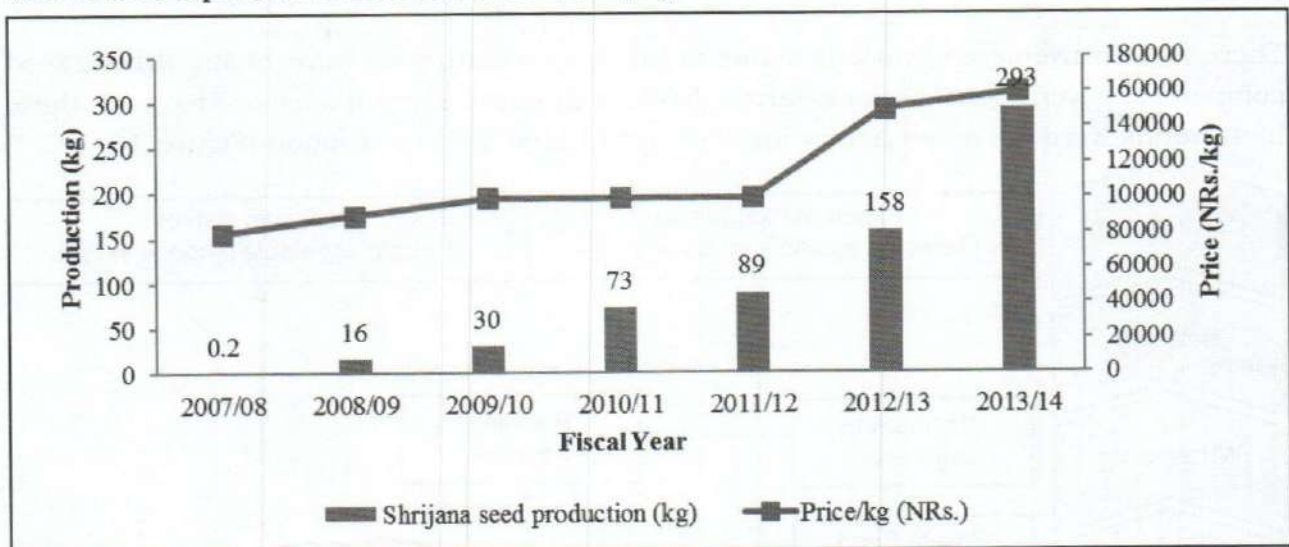


Figure 1. Trend of production and price of Shrijana hubrid tomato in Nepal.

Source: Field survey (2014)

Share of actors in Shrijana hybrid tomato seed production

A total of 293 kg seed of Shrijana tomato was produced by the various actors in FY 2013/14 in Nepal with their different production share (Figure 2). Gorkha Seed Company was the major actor producing more than half (55%) of the total Shrijana seed produced in the country followed by SEAN Seed Company, CEAPRED, and Anamol Seed Company

with their respective share of about 19%, 10%, 5%. While others (other actors) such as Agroshala Nepal, Mero Agro Limited, and Puspanjali seed producer group each shared about 3% of the total seed production. One of the NARC stations ARS, Malepatan and farmers associated with it shared about 1% of the total Shrijana seed production in Nepal while Kasthamandap Trade Point and one of the governmental farm Sub-tropical Vegetable Production Centre (SVPC), Rukum each shared less than 1% of the total Shrijana seed production in Nepal. Out of the total Shrijana seed production (FY 2013/14), private sector had the largest share (85.2%) in Shrijana seed production followed by NGO (10.4%), farmers group (3.1%) and governmental station/farms (1.4%) respectively.

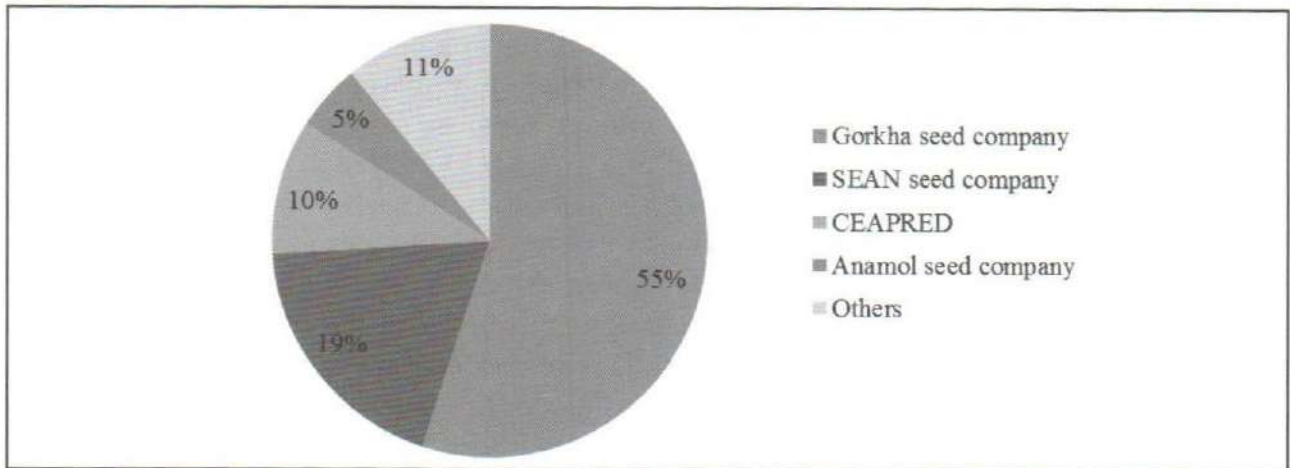


Figure 2. Share of actors in Shrijana tomato seed production in Nepal.

Source: Field Survey (2014)

Value chain map, marketing practice, marketing margin of Shrijana tomato seed

There was involvement of various actors in Shrijana tomato seed value chain. Private seed companies, government stations/farms, NGOs and farmers' groups associated with these institutions were the major actors involved in Shrijana seed production (Figure 3).

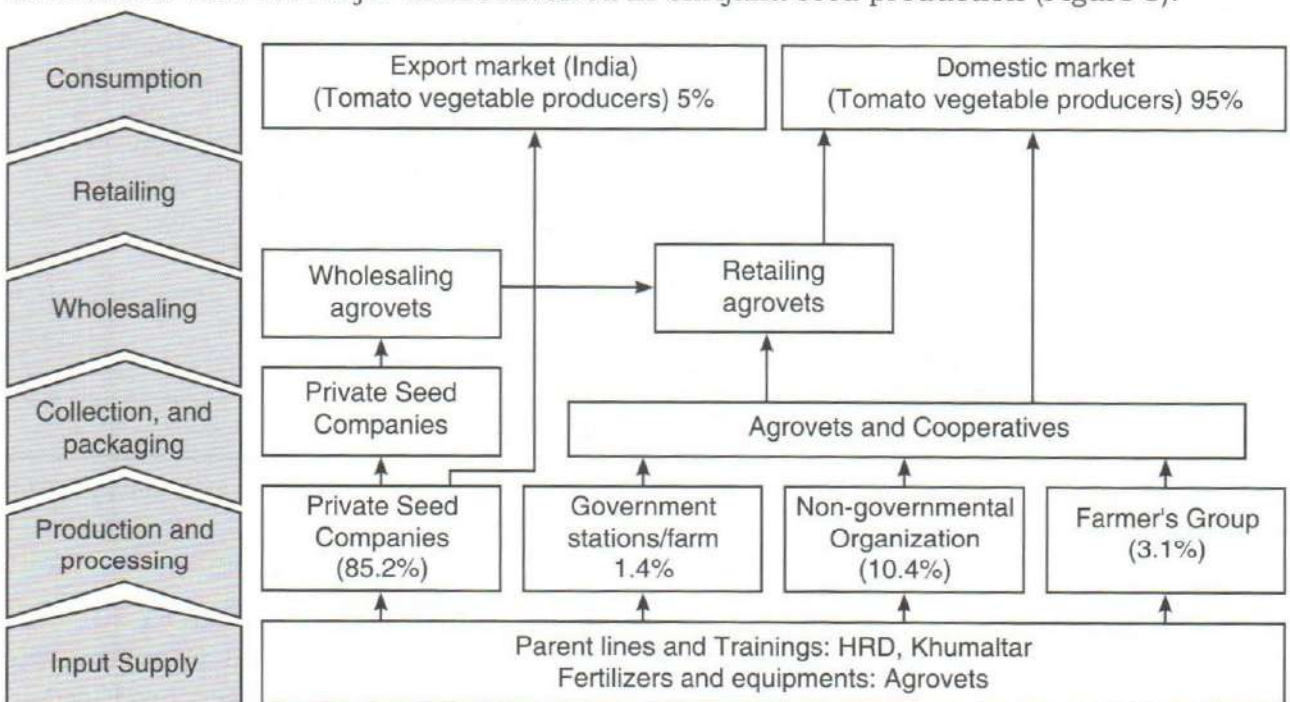
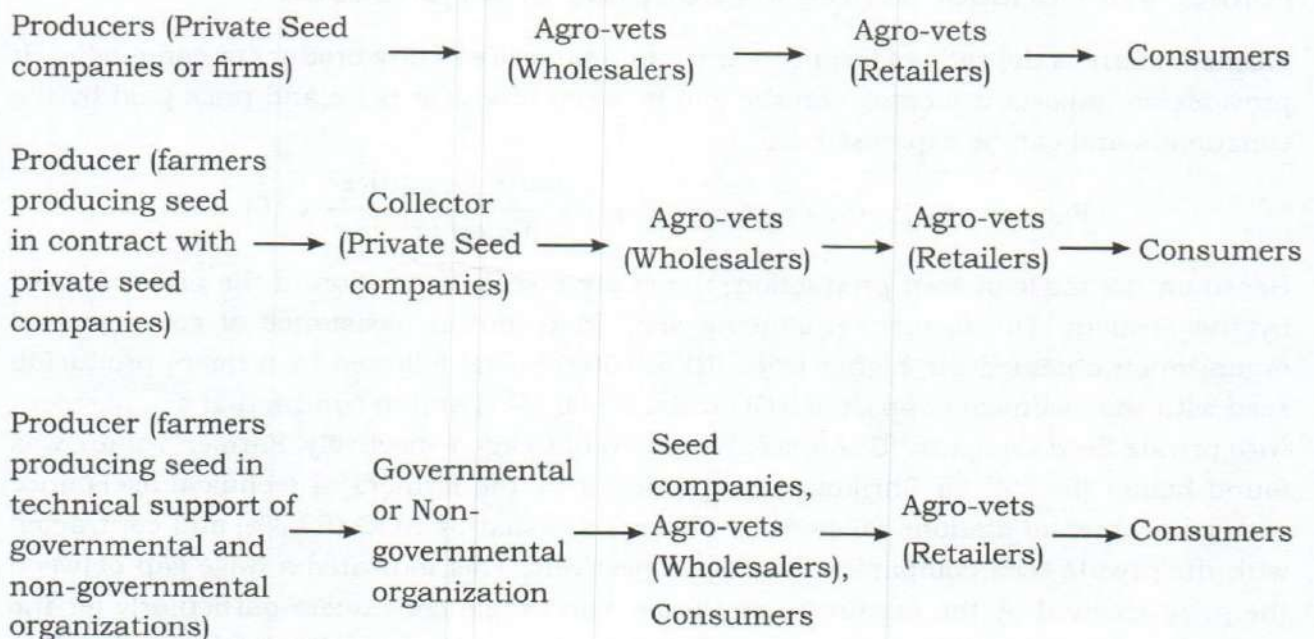


Figure 3. Value chain map of Shrijana hybrid tomato seed

NARC stations particularly HRD, Khumaltar has the mandate for the maintenance and supply of Shrijana parent lines including technical backstopping to the actors involved in Shrijana seed production. The actors producing Shrijana seed most often obtain the parental lines mostly through HRD, Khumaltar. However, Gorkha Seed Company being involved informally in the development of Shrijana hybrid tomato technology has also maintained the parent lines and made use of it as well as supplied it to other actors for Shrijana seed production. Overall, private sector was the dominant actor producing Shrijana tomato seed in Nepal. There was a practice of processing the seed manually by all the actors. After processing, private sectors often had a practice of doing seed testing, truthful labeling and packaging activities by themselves and then the seed was supplied to wholesaling agro-vets, and then to retailing agro-vets and ultimately to the tomato vegetable growing farmers. While governmental research station/farm, NGO and farmers associated with such institutions had a practice of selling the seed either to the agro-vets or cooperatives or any other buyer demanding the seed mostly without labeling and packaging. The seed was however further packaged and labeled by the latter actors and sold in the market. About 95% of the total seed produced in Nepal in FY 2013/14 was consumed within the country while about 5% was exported to India. Gorkha Seed Company was the actor exporting a part of its production to Sikkim, India and claimed a growing demand for Shrijana tomato seed even in the international market

Agro-vet was the major actor for supplying seed from seed producer`s farm to the Shrijana tomato vegetable producer`s farm. Some of the agro-vets such as NEMACOL Multipurpose Cooperative Limited, Kathmandu or in joint venture (such as Pokhara Seed Company, Kaski) also had a practice of collecting seed through making pre-contract with seed producer farmers that are technically assisted by the government and non-government organizations. Seed after collection from farmers was sold in the market with their own labeling and packaging. The marketing practice of Shrijana hybrid tomato seed is depicted in Table 2 below

Table 2. Marketing channel and market flow of tomato seed in Nepal



Marketing margin is the difference between the value of a product or group of products at one stage in the marketing process and the value of an equivalent product or group of products at another stage. Seed producers supply the seed mostly through the agro-vets which is then sold to the farmers. The study revealed a marketing margin of about 17% to 25% taken by the agro-vets while selling Shrijana tomato seed (Table 3). Marketing margin appeared to be higher for the agro-vets or actors who collect the seed directly from the farmers than those collecting it from the seed companies. However, those agro-vets or actors had to bear the cost of packaging, labeling and storage for the seed collected from the farmers.

Table 3. Marketing margin for the actors involved in marketing of Shrijana tomato seed

Actors producing Shrijana tomato hybrid seed	Purchasing price of Shrijana seed of different seed companies for the agro-vets (NRs./kg)	Selling price of Shrijana seed by the agro-vets (NRs./kg)	Marketing margin of the agro-vets (NRs./kg)
Gorkha Seed Company	1,50,000	1,75,000	25,000
Anamol Seed Company	1,30,000	1,62,500	32,500
SEAN Seed Company	1,20,000	1,50,000	30,000
Agroshala Company	1,40,000	1,65,000	25,000
Farmers assisted by CEAPRED farmers	80,000	1,50,000	70,000
Governmental stations (ARS and SVPC)/farmers assisted by them	80,000-1,00,000	1,50,000	50,000-70,000
Puspanjali Farmers Group	90,000	1,50,000	60,000

Farmer`s or Producer`s Share in retail price of Shrijana seed

Farmers share is the ratio of farm gate price to retail price of any product or commodity. It provides an important message on the gap between producer price and price paid by the consumers and can be expressed as,

$$\text{Farmer`s or Producer`s Share (\%)} = \frac{\text{Farm-gate price}}{\text{Retail Price}} \times 100$$

Based on the mode of seed production, the study revealed variation in the price received by the farmers. The farmers producing seed in technical assistance of governmental organization obtained the higher price (NRs. 100,000/kg) followed by farmers producing seed with the technical support of NGO (NRs. 80,000/kg) and in contractual arrangement with private Seed Company (SEAN seed) (NRs. 40,000/kg) respectively. Farmer`s share was found higher (66.6%) for Shrijana seed produced by the farmers in technical assistance with governmental stations followed by farmers assisted by NGO (53.3%) and contracted with the private seed companies (26.7%) respectively. This indicated a huge gap between the price received by the producers and price paid by the consumers particularly for the farmers associated with the private Seed Company. It indicated a higher tendency of private seed companies making the higher profit at the expense of farmers and distributing the profits of a business unfairly to other chain actors. Majority of the seed producing farmers

were also not satisfied with the price received from the Seed Company and such an unfair distribution of profits is likely to affect on the sustainability of Shrijana seed business operation between those contracting parties (Table 4).

Table 4. Farmer's or Producer's share in retail price of Shrijana seed

Mode of farmers involvement in Shrijana tomato hybrid seed production	Farm-gate price (NRs./kg)	Retail Price (NRs./kg)	Farmers/producer's Share (%)
Farmers producing Shrijana seed in assistance of the governmental organization	100,000	150,000	66.6
Farmers producing Shrijana seed in assistance of the non-governmental organization (CEAPRED)	80,000	150,000	53.3
Farmers producing Shrijana seed in contract with Private Seed Company (SEAN Seed Company)	40,000	150,000	26.7

Economics of Shrijana tomato seed production

Shrijana seed was produced by different actors with different management practices such as size of plastic tunnel, use of inputs, and intercropping operations across the locations. This study generated information on economics of Shrijana seed production based on the cost and benefits associated with Shrijana seed production in a plastic tunnel (12m x 5m =60 m²) in farmers field of Kavre district. The cost for the durable items such as plastic for tunnel preparation and other materials has been calculated taking their depreciation value (considering their expected life of 4 years) (Table 5).

Table 5. Economics of Shrijana tomato seed production in a plastic tunnel (12m x 5m =60 m²)

Particulars	Amount (NRs.)
Input cost: seed (parent lines), chemical fertilizers, FYM/Compost, Micronutrients and pesticides	3,395
Labour cost: tunnel and field preparation, intercropping operations, crossing activities, harvesting, seed extraction, cleaning, drying, packaging and marketing	32,800
Tools/equipment cost (after depreciation): plastics, bamboo poles/sticks, jute ropes, irrigation tank and pipes, sprayer, forceps, scissors, petridish	4,450
Total cost	40,645
Average production of seed	1 kg
Price per kg of seed	80,000
Net profit from seed production in a plastic tunnel of area 60 square meter	39,355
Benefit cost ratio	1.96

Even though, Shrijana tomato hybrid seed production is a painstaking job, the study revealed it as one of the important options for employment and income generation to the farmers. While producing Shrijana tomato seed, cost was incurred in inputs, labour and tool/equipments, and largest share of production cost (81 %) was incurred in labour followed by tools/equipments (11%) and inputs (8%) respectively. It can also be estimated that an employment for 80 labour days is generated for producing about 1 kg of Shrijana tomato seed. Shrijana seed production by different actors was also providing a huge employment opportunity to women as in most cases women were primarily involved in producing Shrijana tomato seed. It is also estimated that farmers can generate an income of about 0.3 million (3 lakhs) Nepalese rupees from one ropani (0.05 ha) of land given that they obtain fair market price and average production of not less than 1kg of seed in a plastic tunnel (12*5 square meters).

Quality issues and constraints associated with production of Shrijana hybrid seed

Shrijana is one of the most popular varieties of tomato among the farmers in Nepal. The demand and supply of the seed of this variety is increasing gradually; however majority of the farmers interacted during this study expressed an increasing supply of poor quality Shrijana seed in the market and this had resulted into economic loss as well as declining faith of farmers towards the Shrijana variety. As there was involvement of wide range of actors from public to private sector, non-government organization and farmers groups in Shrijana seed production, there was also a varying interest, skills, knowledge and capacity among these actors in Shrijana seed production. It is very difficult to identify and control the production and supply of poor quality seed until and unless the seed monitoring and quality control systems are strong and effective. Presently, quality assurance regulations and mechanisms such as field inspections, seed testing, monitoring and seed certifications from the public sector are poor and less effective. A couple of field inspections are made by Seed Quality Control Centre (SQCC) and HRD, Khumaltar for monitoring the quality of Shrijana hybrid seed production, however it is not adequate and effective. The seed producers also do not have easy access to seed testing and technical services in seed production particularly in the hill and mountain regions, while seed certification has not yet been in practice for vegetable seeds in Nepal. There is also very limited capacity building support activities to Shrijana seed actors by the public sector. Having higher market price as well as demand for Shrijana tomato variety, there is also increasing involvement of actors in its production and marketing. But Shrijana tomato seed appearing as a lucrative enterprise has also increased tendencies of adopting unhealthy practices among these actors, and actors having poor technical capacity in production and orientation of grabbing the short term benefit from its business has also resulted in the flow of poor quality seed in the market which has eventually lowered the faith of farmers towards this variety. Since production of hybrid seed is a complex activity requiring utmost technical care and supervision, it is very necessary to take initiatives and measures (such as field inspection, seed testing and certification, monitoring, capacity building and other support programs) to enhance the production and supply of quality Shrijana seed. On the other hand, seed producing actors are facing a problem of limited access to the parental lines, limited availability of skilled human resource for crossing and seed production activities, increasing incidence of diseases (nematode, fungal and viral diseases) on the plant that has hindered them from producing quality Shrijana tomato seed. HRD, Khumaltar provides parent lines only to the publically recognized organizations such as private seed companies or NGOs. Parental lines are not provided to any individual farmer interested in

Shrijana seed production until and unless he/she is attached to such companies, NGOs or other formal institutions recognized by the SQCC. On the other hand, the farmers/farmers groups/cooperatives producing Shrijana seed with technical assistance of NGOs are facing problems in accessing the parental lines after the termination of projects implemented by NGOs as NGOs are less likely to support the beneficiaries of past projects. Lack of easy access to the parental lines affects on the income and employment generation of already skilled human resources and eventually reduces the production and supply of Shrijana tomato seed. Therefore, apart from ensuring seed quality control mechanisms and capacity building activities, it is also equally necessary to develop regulations and public-private partnership modality for enhancing the easy and sustained access of quality Shrijana parent lines to the interested seed producers and assuring the production and supply of quality Shrijana seed in a sustainable way.

Various actors receiving parental lines from HRD, Khumaltar for Shrijana seed production also expressed that they observed quality problems such as disease incidences (nematode, viral and fungal diseases) as well as off type fruit sets even in the parent lines supplied to them. Similarly, Gorkha Seed Company who was using own maintained parental lines for Shrijana seed production also admitted that it also had faced a similar problem in some of the plots maintained for the parent lines. Availability and use of quality parental lines is vital to the production of quality Shrijana seed. Therefore, focus should be paid to improve the quality of Shrijana parent lines and supply of the parent lines should be channelized through one door for the quality monitoring and assurance of hybrid Shrijana tomato seed.

Conclusion and Recommendations

Tomato is one of the most popular vegetables grown in Nepal. Shrijana hybrid tomato is one of the best hybrid technologies so far developed by NARC. Shrijana hybrid variety embraces the various attributes which are much preferred by the farmers and therefore, the demand as well as production, supply and price of Shrijana seed is also gradually increasing over the years. Shrijana tomato hybrid seed production being one of the lucrative enterprises; various actors (governmental and non-governmental organizations, private seed companies and farmers groups) are increasingly involved in the production and marketing of Shrijana seed in Nepal. On the other hand, farmers have also increasing complaints on the flow of poor quality Shrijana hybrid seed in the market. Similarly, Shrijana hybrid seed producers are also not confident with the quality of the parental lines that they use for producing the seed. In addition, poor access of the parental lines and limited availability of the skilled human resources has also constrained the quality Shrijana seed production. Therefore, it is very necessary to focus on improving quality monitoring, production and use of genetically pure Shrijana parental lines and source seed as well as capacity building of value chain actors for ensuring the sustainable and efficient production and supply of quality Shrijana hybrid seed in Nepal. Furthermore, it is also necessary to devise regulations and public private partnership modality for enhancing the sustained access of quality Shrijana parental lines to the seed producers and quality seed to fresh tomato producers.

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