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RESEARCH ARTICLE

# ROLE OF QUALITY SEEDS IN FOOD SECURITY AND FOOD SELF-SUFFICIENCY IN NEPAL

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## ARTICLE DETAILS

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## ABSTRACT

Seed is the basic unit of production in agriculture. Without seed the existence of living being in earth is not possible. These seed if viable, under favourable condition grown into green plants. These green plants are the only producer of the planet on which all creatures depend upon. So, seeds are the major element for production, from which other consumers can survive. So, for the human survival we need high yield from optimum input. Seeds are major factor in which yield mostly depend upon. Hence selection of seed must be done with proper study. A viable, pure seed free from disease and pest, having high genetic potential must be selected and sown in its suitable agro climatic condition at its seasonal time for the expected yield. Quality seeds have different parameters like good germination, enough moisture, high physical and physiological purity, disease and pest free. So that quality seed has higher capacity of greater crop stand and production. In context of Nepal, many people are affected from food insecurity. Production of agricultural product has comparatively lowered. Nepal is insufficient in production. So the present production is not able to meet the food demand of existing population. Hence, to increase the fulfilment of food demand of existing population, production and distribution of quality seed is\* required. Many agricultural operations are done to help the plant for its better performance such that the risk in yield loss is minimized. Seed with high yield, disease resistance and moisture/drought tolerating capacity must be preserved. These characters are needed for other future research works so, whether its wild or domesticated species, these character bearing seed must be conserved in seed banks. A country can become self-sufficient, and food secured with the application of quality seed on production technology, building of cold store in different regions for storage and prevention of post harvest loss and finally making food accessible to everyone.

### KEYWORDS

Quality seed, Food Security, Food self-sufficiency, Seed System

## 1. INTRODUCTION

Structurally a true seed is a fertilized matured ovule, consisting of an embryonic plant, a store of food and a protective seed coat, a store of food consists of cotyledons and endosperm (Seed :: Seed Certification, n.d.). Given the appropriate growth condition it will give rise to new plants. It also refers to propagating materials of healthy seedlings, tuber, bulbs, rhizome, roots, cuttings, setts, slips, all types of grafts and vegetative propagating materials used for production purpose (SEED QUALITY Concept, 2015). Gymnosperm and angiosperm plants produce it after their ripened ovules, which take place after fertilization and some growth within the mother plant, mature. Developing the embryo from the zygote and the seed coat from the integuments of the ovule completes the process of reproduction in seed plants, which was initiated with the creation of flowers and pollination (Seed, n.d.). The quality of the seeds is crucial to increased crop production. A seed's quality is determined by its varietal purity, germination rate, lack of illness and disease organisms, weight, and moisture content. Good germination, quick emergence, and vigorous development are all ensured by high-quality seed. Seeds are the basic unit for food. Healthy seed give healthy plant and healthy plant give the good production. So for the food security we need to develop and secure the high yielding seeds. Only quality seeds can fulfil the demanding amount of food required for present population. Land is limited so from same limited land we have to produce more so it is only possible from the seed giving better yield.

According to the 2016 Nepal Demographic and Health Survey, 4.6 million people in Nepal still experience food insecurity, with 20% of families experiencing mild to moderate food insecurity, 22% experiencing

moderate to severe food insecurity, and 10% experiencing severe food insecurity (DHS). According to the report, households in rural areas of the nation where food prices are typically higher are more likely to be food insecure than households in urban areas. In Nepal, malnutrition is still a problem. The UN World Food Program (WFP) says that more than 40% of Nepalese children under the age of five are stunted and 10% are wasting due to acute malnutrition. Pregnant and Lactating Women (PLW) frequently have both malnutrition and nutritional deficits. According to the UN organization, 1.4 million PLW are undernourished and 48 percent have anemia. (Food Assistance Fact Sheet - Nepal n.d.). Food insecurity is on the rise globally, according to the recently released Global Food Security Index (GFSI) 2020 report. Nepal got 77<sup>th</sup> rank on Global Food Security Index (GFSI) 2020. In the Terai region, 72% of households were self-sufficient in food, compared to only 11% in the Mountain region. Similar to this, 53% of Bahun/Chhetri households and only 10% of those belonging to the occupational caste were food self-sufficient (Joshi and Maharjan, 2007).

## 2. RESULT AND DISCUSSION

### 2.1 Seed System

Farmers can obtain high-quality seed of the new crop kinds they want and require through seed systems. Production can potentially be increased fast and affordably with effective seed systems. If you provide farmers with access to quality seed and information about better techniques, their yields can significantly increase. Nepal's national seed system involves four different types of players public institutions, the private sector, international collaborators and farmer communities (Gauchan et al., n.d.).



**Figure 1:** Actor in Nepal's national seed system (adapted from Gauchan et al., n.d.) Seed systems are mainly categorised into two;

**2.1.1 Formal Seed System**

The formal seed system is a deliberately constructed system that involves a chain of activities leading to genetically improved products: certified seed of verified varieties (Almekinders' et al., 1994). Plant breeding or a variety development program with a proper release and maintenance mechanism is where the chain begins. The formal system's guiding principles are to preserve varietal uniqueness and purity as well as to produce seed with the best possible physical, physiological, and hygienic qualities. Through a small number of officially approved seed retailers, certified seeds are marketed and distributed, typically for sale. The formal system's main tenet is that "seed" and "grain" can be distinguished with clarity. The informal system does not clearly define this distinction.

**2.1.2 Informal Seed System**

Farmer-saved seed is the foundation of the informal system, often known as the local seed system. Farmer-saved seed, which is produced, distributed, and accessed directly from a farmer's harvest and would otherwise be sold as grain, predominates in these systems. Farmer-saved seed is also traded and exchanged among friends, neighbors, and family members, and sold in rural grain markets. Landrace varieties developed over time by farmer selection or enhanced varieties initially received from the formal system may be found in the informal system (Shrestha et al., 2012). There is no emphasis on variety identity, genetic purity, or quality seed. They are guided by local technical knowledge and standards and by local social structures and norms.

**2.2 Quality Seeds**

Only when a seed possesses its unique quality in terms of physical, physiological, genetic, and health elements is its capacity completely utilized. When compared to an acceptable level, seed quality refers to the degree of excellence. Quality seeds are those that meet the necessary requirements for purity, germination, and other characteristics (Definition-Quality Seed, n.d.). Seed quality is the possession of seed with required genetic and physical purity that is accompanied with physiological soundness and health status. One of the most important components for the livelihoods of agricultural people is seed. It is the repository of agricultural species' and their variants' genetic potential as a result of ongoing development and selection over time. Seeds have significant potential advantages for crop productivity and food security. Additionally, where there are market connections, the increased production brought about by the usage of adapted cultivars boosts farmers' income. The farming community's ability to secure its seed supply is crucial for food security ( Seed Systems, n.d.).

**2.3 Characteristics of Quality Seeds**

The major seed quality characters are discussed as below.

**2.3.1 Physical Quality**

It refers to how free a seed is from contamination by other seeds, trash, inert materials, diseased seed, and insect-damaged seed. The physical characteristics of the seed should include adequate moisture content, consistent size, weight, and color, as well as the absence of stones, dust, leaves, twigs, stems, blooms, and fruit, as well as other crop seeds and inert material (Good Quality Seed Production, n.d.). Additionally, it must be free of seeds that are shriveled, infected, mottled, moldy, discolored, damaged, or empty. The seed should be clearly recognizable as belonging to a certain species or species from a particular group. Lack of this character trait will have a negative impact on seed planting value and field establishment. By

properly cleaning and grading the seed (processing) after collecting and before sowing or storing, this quality character might be accomplished with seed lots.

Table 1: Higher Physical Purity for Certification	
Crops	Percentage
Maize, Okra	99%
Carrot	95%
Sesam, Soyabean and jute	97%
Soyabean	96%
All crops (most))	98%

A crucial factor while harvesting, drying, storing, and selling grains is moisture content (mc). Grain that has an excessively high moisture content runs the risk of losing quality and becoming less marketable. However, excessive drying is inefficient and could result in lower results (Hossain et al., 2017). From harvest until sowing, it is the main determinant of whether or not the seed will maintain its germination. The amount of moisture can be measured in a lab. Moisture meters can be used to quickly and accurately assess moisture represented as a percentage of weight on the spot.

Table 2: Optimum Moisture Content of Different Crops	
Crops	Percentage
Cereals	10-12%
Pulses	7-9%
Vegetables	6-7%
Oilseeds	5-6%

**2.3.2 Physiological Quality**

Seed vigor and seed germination are among the physiological quality traits of seeds. Viability describes a seed's ability to survive. Germination is the degree to which a seed is alive enough to produce a healthy seedling or the capacity of a seed to produce a seedling with a normal root and shoot under a favorable environment. Seed vigor is the capacity of the seed to produce superior seedlings. The totality of a seed's characteristics is what makes it possible for it to regenerate under any given circumstance (Good Quality Seed). The level of performance of a seed or seed lot during germination and seedling emergence is determined by the seed vigor. Quality seed is defined as seed that performs effectively when sown, and it is categorized as high, medium, or low vigor seed according on how well it produces exceptional seedlings. It is possible to ensure the physiological quality of seed by careful seed selection (matured seed utilized for planting) and by taking care of desirable traits during extraction, drying, and storage. Thus, choosing seeds based on their vigor is crucial for the perfect finalization of crop establishment.

**2.3.3 Genetic Quality**

The seed behaves just as it should. To put it another way, the tree, plant, or seedling that grows from a seed should look exactly like its mother. This quality trait is crucial to reaching the targeted outcome of increasing the crop's production, resistance, or desired quality attributes ( Dharm Singh - Google Books, n.d.)

Table 3: Genetic Purity for Different Classes Of Seeds	
Seed Classes	Percentage
1. Breeder/Nucleus	100%
2. Foundations	99.5%
3. Certified Seed Varieties	98%
4. Certified Hybrid Seeds	95%
5. Certified Hybrid Cotton	90%
6. Certified Hybrid Castor	85%

**2.3.4 Genetic Purity**

**2.3.4.1 Pathological Quality**

The only way to determine the health status of a seed is to look for insect infestation and fungal infection inside or on the seed. Fungi and insect pest infestations should be avoided since they will lower the physiological quality and physical quality of the seed during long-term storage (GPBR 112, n.d.). The deterioration status of the seed, which is likewise reflected

by the seed's low vigor status, is also considered to be a component of its health status. The health of the seed has a direct impact on the seed quality traits and ensures their soundness in seed for the generation of superior seedlings at the nursery or field.

## 2.4 Seed Security

Farmers in underdeveloped nations or regions that frequently experience droughts or other natural or man-made calamities are especially dependent on the availability and access to seeds. In order for rural households, especially farmers and farming communities, to have ready access to sufficient quantities of high-quality seed and planting materials of crop varieties that are adapted to their agro-ecological conditions and socioeconomic needs at the time of planting, under both typical and unusual weather conditions, is what is meant by seed security. Better understanding of them is required in order to support initiatives to enhance seed security (*Seed Systems: Seed Security and Rehabilitation*, n.d.). Food security for small-holder farmers requires seed security. In Nepal, timely and ample supplies of high-yielding types of quality seed might potentially boost crop yields by 15–25% (Gauchan et al., n.d.).

## 2.5 Seed Production

The creation of top-notch seed is essential to modern agriculture. The majority of annual crops are started from seeds each season, and seed quality can have a significant impact on crop production potential. Improved genetics, new planting and production techniques, and crop protection techniques can all be delivered through seeds, increasing agriculture's overall efficiency and lowering its environmental effect. The process of producing high-quality seed is meticulous. Planting seeds on clean land that hasn't recently been used to grow the same crop, removing rogue plants or plants that aren't true to the variety's characteristics, and using physical isolation techniques like mesh cages, distance isolation, time isolation, or hand pollination are just a few of the measures taken by seed producers to protect genetic integrity (P.K. Ghosh et al., n.d.). Through the International Food Policy Research Institute (IFPRI), the Nepal branch of the United States Agency for International Development is supporting the Government of Nepal in its efforts to improve the policy and regulatory environment for seed production by addressing sales regulations and supporting the enactment of farmer- and agribusiness-friendly input policies and procedures.

(IFPRI South Asia Office, n.d.)

## 2.6 Food Security

There are various ways to describe food security, but one of the more popular definitions is that offered by the 1996 World Food Summit: When everyone, at all times, has physical and financial access to enough, safe, and nourishing food that satisfies their dietary needs and food choices for an active and healthy life, that is when food security exists (Engler-Stringer, 2014). According to this widely accepted definition, food security has the following components.

### 2.6.1 Food Availability

All individuals should have access to sufficient amounts of wholesome food, especially the impoverished, whether it comes from home production or imports (including food aid) (III. Food Security, n.d.).

### 2.6.2 Food Access

It also highlights the dynamic nature of the idea of food security, emphasizing the need for steady long-term access by individuals to sufficient resources (entitlements) for procuring appropriate foods for a nutritious diet. Given the legal, political, economic, and social structures of the community in which a person resides, entitlements are defined as the collection of all commodity bundles over which a person can exercise control (including traditional rights such as access to common resources).

### 2.6.3 Utilization

Utilizing food to fulfil all physiological demands through a healthy diet, access to clean water, sanitary conditions, and medical care. This highlights the value of non-food inputs in ensuring food security.

### 2.6.4 Stability

To be food secure, a population, household or individual must have access to adequate food at all times. They should not risk losing access to food as a consequence of sudden shocks (e.g. an economic or climatic crisis) or cyclical events (e.g. seasonal food insecurity). The concept of stability can therefore refer to both the availability and access dimensions of food security.

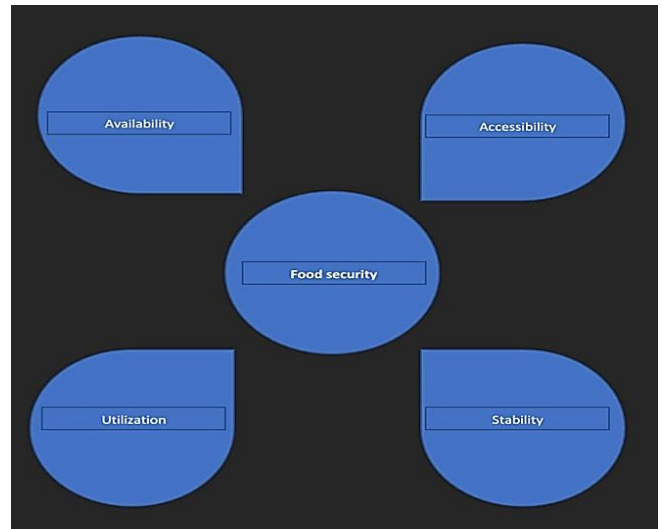


Figure 2: Four components of food security

## 3. QUALITY SEEDS RELATED WITH FOOD SECURITY AND FOOD SELF-SUFFICIENCY

Ultimate source of food is from the seed. Quality seed germinates and grows through life stages like vegetative, reproductive and ripening stages so we can harvest the seeds. According to our purposes we store the harvested seeds, either for grain (as a feed) or as a seed for sowing on next season. First of all, these quality seeds are produced by different institutes like NARC (Nepal Agriculture Research Council), SQCC (Seed Quality Control Centre), Seed bank, plant breeding centres and different cereal crop research stations. Here different experiments and treatments are done to develop the new variety. Varietal and agronomic operation trials are done to see the yield comparison between different varieties so that more work can be done and high yielding seed can be produced. Disease and insect resistance character, drought and moisture tolerating, different locations are also introduced from wild varieties. Different research stations develop different seeds of vegetables, cereals, legumes, oil, fruits and many other commercial and cash crops.

Different methods of propagation are used to develop desired characters in plants. High yielding scions are used in grafting of fruit trees. Hybridization is done in wheat, maize and many other cereal crops. Those developed seeds which have desired characters and high yielding capacity are stored in seed banks and in more quantity, they are developed and available for farmers and seed-selling agro-vet stores. Those seeds are available for farmers in proper season time in affordable prices. These are all under the authority of seed developing centres and agriculture ministry. Those developed seeds distributed to farmers are sown in their fields in the seasonal time. Here, mainly cereal grains are consumed as a food source so farmers mainly grow and focus on cereal crops. Other like grain legume, oil seed, vegetable and fruits are not cultivated much as cereals. So, after sowing, emergence and vegetative growth starts with many intercultural practices like weeding, earthing up, top dressing, thinning and gap filling etc. are done according to crop type.

In fruit training is done to give proper shape for the plant. Later in cereals and vegetable weeding, irrigation, manuring and fertilizer application etc. Proper care and management are done for vegetables whether it is seasonal or off-season. Many losses in yield are seen due to disease, insect pest, nutrient deficiency and uncertain climatic conditions. So specially vegetables are grown in plastic houses, greenhouses, tunnel houses etc. So, after flowering, seed formation starts and later after its maturity it is harvested. Harvesting includes reaping, drying, threshing and for storage they are again drying, cleaning and stored in a suitable environment. A lot of loss happens during the post-harvest period specially in grain legumes and oilseeds, also in highly matured cereal crops so it must be minimized for a fair result of yield. According to future use purpose, harvested seeds are stored whether it is for seed or for grain. In case of vegetables and fruits after their maturity, harvested and eaten freshly. With the help of quality seed and proper management practices, a greater amount of yield can be gained than the normal one.

So, in this way from the quality seed again the seed is gained. Food and feeding systems here are mainly consumption of cereal grains like rice, wheat, maize with pulses and vegetables. So, for food security here research and experiment in cereal seeds are mostly done for the greater yield so the population here gets nutritive food. Here mostly research



work is done on rice, wheat, maize, millet. Around 60-70% of total population consumes rice so quality seeds of rice is very essential for higher production and being self-sufficient. Here main problem is that suitable quality seeds are not even completely developed and distributed which can be cultivated according to their agro climatic condition. Present scenario is our total production is not enough to meet the demand of our total population. So, we need high yielding quality seed as soon as possible so we can produce enough food for our population. Later if the production is higher than demanding food amount of total population, we have to think about storing of reserve food to be secured for the future if due to any reason we cannot produce as much as than now. And also if more amount is produced its our responsibility to feed the people of other nation by exporting our product. So, for the food security requiring amount of food should to produce, store and export to other for whole world's better health without damaging the soil health and other environmental aspects.

#### 4. CONCLUSION

The purpose of the study is to determine the contribution of quality seeds to ensure food security and food self-sufficiency in Nepal. Quality seeds have better performance so that it can be established good crop stand. Quality seed have better germination, high purity, good health, enough moisture and mainly better yield. The overall food insecurity across the country has improved compared to April and August 2020, however it remains slightly worse than 4 years ago. Hence, self sufficient in food to cope the food insecurity the production of quality must require in the country. Only the high production makes the country self-sufficient which is only possible by quality seed. When country produce enough food, many people can afford it.

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