*Himachal Journal of Agricultural Research 42(2): 162-169 (2016)*

# Status of seed production and distribution in Himachal Pradesh

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Received: 14 September 2016; Accepted: 27 November 2016

**Abstract**

**This study presents the status of seed policy, production and delivery mechanism for two major crops *viz*., rice and wheat in Himachal Pradesh. The adoption process of new variety of crop is influenced by the speed at which the breeder seed is multiplied to produce adequate quantity of foundation and certified seed. However, actual internal supply of certified seeds of these two main cereal crops in the state was found to fall short of the normative demand for 20% replacement showing low seed replacement ratio (8 to 10%). The production of foundation seed on State Seed Multiplication Farms (SMFs) not only decreased over the years but also showed wider year to year fluctuations. The production of certified seeds by registered growers also showed glaring year to year fluctuations bringing instability in the supply of seeds of improved varieties in the state. Therefore, number of certified seed growers and area under certified seeds should be increased (from the existing level of less than 1% to at least upto 2% of the cropped area).There are also no special efforts on the part of research institutes to popularize their released varieties and majority of the farmers were not aware of new varieties. Public R & D institutions need to forge public private partnership to integrate research, extension, seed production and marketing for better performance and seeddistribution. There is also a need to develop effective seed quarantine mechanism so as to check the supply of spurious seeds and the seeds of varieties which are highly susceptible to diseases. Moreover, private seed agencies and village level primary cooperative societies should also be encouraged to participate in the seed production and distribution programme.**

**Key words:** seed production, seed requirement, seed multiplication, seed village scheme, certified seeds, seed replacement, constraints and strategies,

Seed is regarded as the mother of all technologies in agriculture and seed is the most critical input in production of crops as the quality and genetic potential has a direct bearing on response of other inputs in raising productivity in agriculture. Resolution passed at the 53rd meeting of National Development Council (NDC) in 2007 accorded the highest priority to seed production so that adequate supply of quality seeds of relevant major crops and fodder is available at reasonable prices and at the right time (NDC 2007). Rightly so, the biggest bonanza of Indian agriculture witnessed in mid sixties- the green revolution has been the outcome of such efforts turning a food deficit country into a surplus country (Bhalla and Tyagi 1989).

With the passage of time, seed market has undergone a sea change in size and structure. Once, a sole domain of public institutions, the private sector has entered in a big way in seed market. However, private sector participation has been mainly in development of hybrid seeds of high value commercial crops with very little involvement in open pollinated non-hybrid varieties (OPVs) of cereals (rice and wheat) and pulses (Ramaswami 2002). For the crops like rice and wheat, the principal source of seed is still the public sector though the biggest supplier is the farm sector itself using nearly 75% of the seed requirement saved from the previous crops (Verma and Sidhu 2011). The main reasons *inter alia* may be inadequate supply of certified seeds (Singh *et al.* 2002; Kunal and Murthy 1994). On the other hand, private seed companies because of infrastructure, promising and germplasm bank (though at the behest of public sector) with the latest know how and aggressive marketing strategies have made discernible growth over time. However, onus is on the public policy to ensure that seed supplies to resource poor farmers and isolated areas are available (Pal and Tripp 2002).

It has been found that certified seeds of improved varieties (keeping all other factors constant) could enhance the wheat productivity by about 17 to 18 per cent over farmers' saved seeds (Sharma *et al.* 2011). Number of improved varieties of wheat and rice has been developed by HP State Agricultural University, Palampur and other sister institutes spelling no dearth of technologies but main impediment is the delivery mechanism.The adoption rate of high yielding varieties has been found to be a linear function of the availability and distribution of seeds of these varieties. Therefore, an attempt has been made to assess the seed

production and delivery mechanism and to identify the major constraints in seed supply in the state.

## Materials and Methods

The study is based mainly on the secondary data on technology development, seed production and distribution mechanism and constraints, etc., drawn from published/unpublished reports of CSKHPKV, Palampur and Seed Certification Agency of the State Department of Agriculture. The primary data were collected from 100 farmers of Kangra and Mandi districts of Himachal Pradesh during 2008-09 and 2009-10. The data were analyzed by employing tabular technique.

## Results and Discussion

### Rice and Wheat Seed Requirement in Himachal Pradesh

In Himachal Pradesh rice and wheat crops are grown in about 78 thousand hectares and 360 thousand hectares of cropped area, respectively. Keeping in view the average quantity of seed used per hectare of the cropped area, the total quantity of seed of these two crops used in Himachal Pradesh has been estimated (Table 1). During 2008-09, the estimated quantity of rice seed was 45.87 thousand quintals while the quantity of wheat seed came out to be about 395.96 thousand quintals. Over the period, the quantity of seed has decreased due to decrease in the area under rice and wheat crops as the area has been shifted to other crops mainly vegetables.

### Seed Development, Multiplication and Distribution Mechanism

Seed is regarded as the mother of all technological innovations in crop production. The availability of quality seed of new variety and its efficient delivery at right time plays a major role in speedier adoption of new variety/ technology. The transfer of technology and speed of adoption depend mainly on the efficacy of available infrastructure. Keeping this in view ,production and distribution mechanism for rice seed in the state has been examined. There are no private players in the production of improved seeds of wheat crop though there are few private hybrids for rice. Therefore, it is the sole responsibility of the R&D institutes in the public domain to develop improved varieties, multiply seeds and supply to the farmers at the right time. In Himachal Pradesh, State Agricultural University, Palampur, State Horticulture Forestry University, Solan and ICAR institutes in the region are taking on the varietal improvement/development work. Since the establishment of State Agricultural University at Palampur, rice and wheat research has remained the major mandate of the university and rice and wheat research is being carried out through multi location varietal field trials. The Agricultural University has developed a number of varieties for cultivation under varied agro-climatic conditions under All India Coordinated Rice and Wheat Improvement Projects (AICRIP and AICWIP). The state Department of Agriculture has the sole responsibility to multiply first as foundation and thence after as certified seeds of recommended varieties.

It has been observed that seeds of improved varieties

**Table1. Estimated quantity of rice and wheat seeds in Himachal Pradesh**

| Year | Rice area ('000 ha) | Estimated quantity of seed ('000 q) | Wheat area ('000 ha) | Estimated quantity of seed ('000 q) |
|---|---|---|---|---|
| 1990-91 | 84.87 | 50.10 | 376.28 | 413.91 |
| 1995-96 | 83.02 | 49.01 | 357.72 | 393.49 |
| 2000-01 | 81.93 | 48.36 | 362.68 | 398.95 |
| 2005-06 | 79.37 | 46.85 | 346.15 | 380.77 |
| 2006-07 | 79.21 | 46.76 | 349.60 | 384.56 |
| 2007-08 | 78.57 | 46.38 | 365.59 | 402.15 |
| 2008-09 | 77,71 | 45.87 | 359.96 | 395.96 |

**Note:** Seed requirement estimated on the basis of area under each crop and average quantity of seed rate used

of rice and wheat have short life cycle after adoption. The resistant and high yielding varieties after some time are found to break down disease resistance and, thus, need regular replacement with fresh certified seeds. Keeping this in view, the normative demand for improved seeds of rice and wheat has been worked out at the state level assuming 20% replacement every year with supply of certified seeds. In this way, the state requires around 7,000 quintals and 75,000 quintals of certified seeds of rice and wheat, respectively. Therefore, to maintain the continuity of seed chain, there is a need of nucleus seed to the tune of 0.60 quintals of rice and 22 quintals of wheat and subsequently breeder seed 3.00 quintals of rice and 335 quintals of wheat. After seed multiplication, foundation seed quantity of around 140 quintals of rice and 5,040 quintals of wheat should be produced to multiply further the desired quantity of certified seeds. In this seed chain, role of research institutes is primarily to develop new varieties and produce desired quantity of nucleus and breeder seeds for further multiplication at the state level. However, it needs to be mentioned that the ratio of 1:50 in rice and 1:25 in wheat was not attained due to number of constraints in seed production. Due to this, the seed multiplication ratio might decrease and the quantity supplied would fall short of the requirements. Therefore, it is suggested that area under foundation seed should be increased in the state. The mechanism of seed multiplication chain for rice and wheat has been depicted in Table 2.

The nucleus and breeder seeds are produced and provided by CSKHPKV and other research institutes working in hilly region of the country. The breeder seed is supplied to State Seed Farms (SMFs) for further multiplication as foundation seeds (sometimes multiplied as foundation 1 and foundation 2).

One of the major constraints noted in increasing production and productivity of crops is the lack of sufficient quantities of quality seed of improved varieties to be made available to the farmers in time. To overcome this constraint, Government of India has started a programme known as "Seed Village Programme" by which sufficient seed multiplication can be achieved in order to meet local seed requirement besides facilitating supply of seeds at reasonable cost and ensuring quick multiplication of new varieties in a shorter time. Under this programme, potential villages for quality seed production have been identified and suitable number of responding/willing farmers are identified/selected preferably in compact area/ cluster approach. Foundation seed at 50% cost is made available to these identified farmers for production of quality seeds and to train the farmers on seed production and seed technology.

The interested farmers in different districts have been registered with the State Seed Certification Agency for certifying the production process and finally to procure, grade and stock certified seed for supply to farmers through departmental block offices, cooperative societies and private distributors. Seed of wheat is also procured from other states through National Agricultural Cooperative Federation (NAFED) and Agricultural Universities. The contact farmers thereafter are given a schedule of procurement in which the maximum quantity to be procured (which is generally 50 to 60% of total produce), procurement price and place of sale (Seed Grading Centers) is mentioned. The growers are supposed to transport the seed at their own cost and deliver at the assigned Seed Grading Center. After grading and weighting the produce at the Grading Center, the final payment of the producer is settled at the rate prescribed by the State Department of Agriculture. However, this process may take some time due to which the payment is delayed. The delayed payments have been reported by many of the contact farmers due to which they sometimes are inclined to sell the produce to private traders. Resultantly, there is low procurement of seeds from registered growers.

**Table 2. Seed production policy in Himachal Pradesh (q)**

| Crop | Seed multiplication ratio | Nucleus seed | Breeder seed (Research Institutes) | Foundation seed (SMF) | Certified seed (contact seed growers) |
|---|---|---|---|---|---|
| Paddy | 1:50 | 0.60 | 3.00 | 140.00 | 7000.00 |
| Wheat | 1: 15 | 22.00 | 335.00 | 5040.00 | 75600.00 |

**Source:** Department of Seed Production Technology, CSKHPKV, Palampur

**Trends in Seed Production**

The trends in production of breeder, foundation and certified seeds of paddy and wheat over the period have been studied. Table 3 shows the production of breeder seeds of rice and wheat in Himachal Pradesh. The quantity of breeder seed varied considerably depending upon the demand from different stake holders mainly from Department of Agriculture. It has been found that Research Institutions in the state (mainly CSKHPKV) are producing adequate quantity of breeder seeds especially in case of paddy. However, the Directorate of Agriculture allocates the quantity of breeder seeds of different varieties to SMFs located in different districts through District Agricultural Offices (DAOs). At times, there has been less lifting of breeder seeds in certain years due to paucity of field staff or less demand of the variety requisitioned. Obviously, the quantity of breeder seed lifted by State Department of Agriculture would determine the quantity of foundation and certified seeds of different varieties produced in subsequent stages. Presently, there are 25 State Seed Multiplication Farms (SMFs) in the state for producing foundation seeds of different crops including rice and wheat. The total area under SMFs in the state is 418.26 hectares out of which only about 50% area is cultivated. It is surprising to note that many of the SMFs have no irrigation facilities on the farms. Out of the cultivated area of 200.13 hectares, 130.49 hectares (58%) was irrigated. Needless to mention, to maintain the quality and vigour, seeds of the crops need to be produced under best growing conditions with assured irrigation.

Table 4 shows the quantity of foundation seeds of rice (paddy) and wheat produced by SMF in the state over the period 2002-03 to 2007-08. The State Seed Multiplication Farms (SMFs) produced 300 to 500 quintals of foundation seeds of paddy and 2000 to 3000 quintals of wheat seeds. There is wide variations in the quantity of foundation seed produced in the state. The total quantity of seed produced by SMF varied considerably from year to year due to fluctuations in lifting of breeder seeds, lack of irrigation and paucity of staff on SMFs. This also affects the production of certified seeds in the next stage as this quantity of foundation seed is distributed among the registered/contact farmers under 'seed village schemes' in the states for further multiplication.

The area allocated to certified seed production in the

**Table 3. Breeder seed production of rice and wheat crops (q)**

| Year | Paddy | Wheat |
|---|---|---|
| 2002-03 | 19.54 | 146.30 |
| 2003 04 | 19.13 | 170.75 |
| 2004-05 | 11.09 | 166.22 |
| 2005 06 | 12.44 | 319.98 |
| 2006-07 | 18.46 | 290.60 |
| 2007-08 | 30.95 | 278.61 |
| 2008-09 | 37.45 | 200.65 |

**Source:** Seed Production Unit, CSKHPKV, Palampur and Department of Agriculture, Shimla

**Table 4. Production of foundation seeds on State Seed Multiplication Farms in Himachal Pradesh (q)**

| Year | Paddy | Wheat |
|---|---|---|
| 2002-03 | 698.89 | 2439.27 |
| 2003-04 | 600.00 | 2690.80 |
| 2004-05 | NA | 2492.10 |
| 2005-06 | 384.30 | 671.45 |
| 2006-07 | 429.20 | 2331.03 |
| 2007-08 | 400.00 | 2176.22 |

**Source:** Department of Agriculture, Shimla

state has been depicted in Table 5 which clearly shows that the proportion of area under certified seed is even below 1% of the total area under rice and wheat cultivation in the state. Particularly in rice, the area under certified seed varied from as low as 0.17% to 0.58%. In wheat crop too, the area under certified seed ranged from 0.47% to 0.85% of the total area under wheat in the state. The recovery of certified seeds per hectare of area was also found quite low and showed glaring year to year variations making certified seed supply highly unstable. In rice, the recovery of certified seed from the registered growers varied widely from as low as 6q/ha to 17q/ha. In case of wheat, the recovery of certified seeds varied from 9 to 17 quintals per hectare. Consequently, low proportion of area under certified seeds combined with less recovery of seeds from contact farmers make the seed supply not only inadequate but also highly unstable. Therefore, keeping in view the low seed multiplication ratio and less recovery of certified seeds, the area under certified seeds as well as number of registered growers must be increased.

**Table 5.Area under certified seeds**

| Year | Rice | | | Wheat | | |
|---|---|---|---|---|---|---|
| | Certified area (ha) | Certified area % to paddy area | Seed recovery (q/ha) | Certified area (ha) | Certified area % to wheat area | Seed recovery (q/ha) |
| 1996-97 | 145 | 0.18 | 8.78 | 2950 | 0.79 | 14.56 |
| 1997-98 | 150 | 0.17 | 8.81 | 3152 | 0.84 | 13.14 |
| 1998-99 | 168 | 0.19 | 5.96 | 3214 | 0.85 | 14.87 |
| 1999-2000 | 205 | 0.26 | 14.27 | 3144 | 0.85 | 17.09 |
| 2000-01 | 267 | 0.33 | 13.95 | 2661 | 0.73 | 12.66 |
| 2001-02 | 261 | 0.32 | 18.97 | 2820 | 0.77 | 14.58 |
| 2002-03 | 220 | 0.26 | 10.33 | 2695 | 0.75 | 15.63 |
| 2003 04 | 204 | 0.25 | 15.96 | 2696 | 0.74 | 15.34 |
| 2004-05 | 195 | 0.24 | 16.94 | 2704 | 0.74 | 8.72 |
| 2005 06 | 228 | 0.29 | 11.45 | 1692 | 0.47 | 9.76 |
| 2006-07 | 366 | 0.46 | 8.70 | 2042 | 0.56 | 11.12 |
| 2007 08 | 460 | 0.58 | 8.50 | 2361 | 0.64 | 14.40 |
| 2008-09 | 275 | 0.35 | 10.11 | 3044 | 0.85 | 9.17 |

**Source:** State Seed Certification Agency, Directorate of Agriculture, Shimla, H.P.

The trends in the production of certified seeds in consonance with the requirement have been shown in Table 6. It can be visualized that production of certified seeds falls grossly short of the quantity required for 20% replacement (the norms fixed for supply of certified seeds). The registered seed growers (contact farmers) produce certified seeds to the tune of 2000 to 4000 quintals of paddy and 13 to 22 thousand quintals of wheat in the state. During 2008-09, the production of certified seeds of paddy and wheat could meet just 30% and 39% of the requirement (for 20% replacement). During 2008-09, the production of certified seed of paddy was 2,779 quintals against the requirement of 9,325 quintals for 20% replacement. Similarly, in case of wheat the production of certified seeds was 23,902 quintals against the normative requirement of about 72 thousand quintals..In wheat, some deficit in seed supply was being abridged through procurement of seeds from other agencies outside the state mainly from HSDC Haryana, NAFED Rudrapur, NSC Haryana, RAU Kota and IARI Karnal. The overall seed replacement ratio (in relation to total quantity of seed used) varied from just 7 to 8% in rice and 10 to 13% in wheat. This clearly implies that about 90% of the seed used is farmers own saved seed from the previous crop.

**Table 6. Production and requirement of certified seeds in Himachal Pradesh**

| Year | Paddy | | | Wheat | | |
|---|---|---|---|---|---|---|
| | Certified Seed production (q) | Seed required for 20% replacement (q) | Supply of certified seeds to total requirement (%) | Certified Seed production (q) | Seed required for 20% replacement (q) | Supply of certified seeds to total requirement (%) |
| 1996-97 | 1273 | 9809 | 12.98 | 42957 | 74598 | 57.58 |
| 1997-98 | 1322 | 10341 | 12.78 | 41421 | 75469 | 54.88 |
| 1998-99 | 1001 | 10424 | 9.60 | 47792 | 75944 | 62.93 |
| 1999-2000 | 2925 | 9626 | 30.39 | 53725 | 74117 | 72.49 |
| 2000-01 | 3725 | 9831 | 37.89 | 33678 | 72536 | 46.43 |
| 2001-02 | 4952 | 9670 | 51.21 | 41116 | 73304 | 56.09 |
| 2002-03 | 2272 | 9986 | 22.75 | 42123 | 71888 | 58.60 |
| 2003-04 | 3256 | 9761 | 33.36 | 41349 | 72674 | 56.90 |
| 2004-05 | 3304 | 9542 | 34.63 | 23591 | 73554 | 32.07 |
| 2005-06 | 2610 | 9524 | 27.40 | 16521 | 71691 | 23.04 |
| 2006-07 | 3183 | 9505 | 33.49 | 22700 | 72449 | 31.33 |
| 2007-08 | 3908 | 9429 | 41.45 | 34000 | 73318 | 46.37 |
| 2008-09 | 2779 | 9325 | 29.80 | 27902 | 71992 | 38.76 |

Table 7 shows the trends in production of breeder and foundation seeds by CSKHPKV, pattern of allocation and actual lifting by the Department of Agriculture. There has been steady increase in the wheat seed production in CSKHPKV over the years and also equi- proportionate increase in the allocation to state department. However, it is surprising to note that actual lifting of seed by the state agencies is quite low. This is mainly because most of the State Seed Multiplication Farms (SMF) are not able to multiply seeds in the desired quantity. It was reported that these farms are confronted with the shortage of necessary infrastructure and staff.

**Table 7. Wheat seed production and allocation by CSKHPKV and lifting by Department of Agriculture (q)**

| Year | Total production | Allocation | Lifting | Lifting as % to allocation |
|---|---|---|---|---|
| 2002-03 | 356.06 | 261.20 | 84.00 | 32.16 |
| 2003-04 | 422.49 | 264.88 | 9.00 | 3.40 |
| 2004-05 | 478.13 | 338.26 | 20.39 | 6.03 |
| 2005-06 | 420.28 | 327.83 | 45.70 | 13.94 |
| 2006-07 | 519.81 | 342.39 | 22.00 | 6.43 |
| 2007-08 | 284.67 | 270.14 | 33.50 | 12.40 |
| 2008-09 | 670.38 | 522.59 | 100.00 | 19.14 |

**Source: Seed Production Unit, CSKHPKV, Palampur**

The wheat seed production data displayed in Table 8 clearly shows the slow performance of SMF in seed multiplication. There are 24 SMFs in different districts of Himachal Pradesh. Total production of wheat seed was about 2439 quintals in 2002-03 which came down to merely 671 quintals in 2005-06 and increased slightly to 2176 quintals in 2007-08. However, the quantity of wheat seed produced under Seed Village Scheme (SVS) has made satisfactory progress over the years. The production and procurement of seed under SVS increased with modest beginning of just 190 quintals in 2004-05 to the extent of 22791 quintals in the year 2006-07 and 13014 quintals in 2007-08. Obviously, total quantity of seed is not sufficient to meet the desired quantity of certified wheat seed to the tune of about 75,000 quintals annually.

Thus, the slow pace of seed multiplication in the state is the major cause for poor adoption of new varieties of wheat and rice in the state. To meet out the seed shortage, State Department of Agriculture imports sizeable quantity of wheat seeds of different varieties from other sources outside the state. This pattern is amply revealed through Table 9 which clearly shows that during 2007-08 62.53 per cent and 57.32 per cent of total wheat seed distributed in Kangra and Mandi districts, respectively was procured from sources outside the state. However, in 2008-09, the proportion of seed procured from outside state agencies decreased due to more procurement of certified seeds from contact farmers under Seed Village Scheme. The pattern is almost same in all the districts in Himachal Pradesh. This clearly shows that seed multiplication mechanism in Himachal Pradesh need to be streamlined to produce adequate quantity of certified seeds.

**Table 8. Wheat seed multiplication in Himachal Pradesh (q)**

| Year | State seed farms | Contact farmers (seed village) | Total |
|---|---|---|---|
| 2002-03 | 2439.27 | - | 2439.27 |
| 2003-04 | 2690.80 | - | 2690.80 |
| 2004 05 | 2492.10 | 190.00 | 2682.10 |
| 2005-06 | 671.45 | 13761.20 | 14432.65 |
| 2006-07 | 2331.03 | 22290.57 | 24621.60 |
| 2007-08 | 2176.22 | 13014.40 | 15190.62 |

**Source:** Department of Agriculture, Shimla

**Table 9.Wheat seed procurement in Kangra and Mandi districts (%)**

| | Kangra | | Mandi | |
|---|---|---|---|---|
| **Seed procurement** | **2007-08** | **2008-09** | **2007-08** | **2008-09** |
| Procurement within state | 37.47 | 93.24 | 42.68 | 77.05 |
| Procurement outside state | 62.53 | 6.76 | 57.32 | 22.95 |
| | 100.00 | 100.00 | 100.00 | 100.00 |
| Total | (5517.50) | (11822.83) | (12172.51) | (8714.69) |

Note: Figures in parentheses show quantity of seeds in quintals

## Conclusions

The foregoing analysis clearly shows that seed production and delivery mechanism in Himachal Pradesh needs rigorous improvement. It has been found that supply of certified seed in the state falls short of the normative supply for 20 % replacement resulting into low seed replacement ratio (8 to 10%). Production of foundation seeds on State Seed Multiplication Farms have decreased and also showed wider year to year fluctuations. Obviously, adoption process of new variety of crop is influenced by the speed at which breeder seed is multiplied to produce adequate quantity of certified seed and made available to the farmers. Lack of irrigation infrastructure and paucity of staff were stated to be the main

reasons for inadequate production of foundation seeds of crop varieties. The production of certified seeds by registered growers also showed glaring year to year fluctuations bringing instability in the supply of seeds of improved varieties in the state. Therefore, number of certified seed growers and area under certified seed should be increased (at least upto 2%). There are also no efforts on the part of research institutes to popularize their released varieties and majority of the farmers are not aware of new varieties. The research institutes through their Research Stations and KVKs should participate actively in seed production programme by adopting seed villages to supplement the supply of seeds. There is also a need to develop effective seed quarantine mechanism so as to check the supply of spurious seeds and the seeds of varieties which are highly susceptible to diseases. The private seed agencies and primary cooperative societies should be encouraged to participate in the production and distribution of seeds of rice and wheat crops which are so critical for food and livelihood security.

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