Cultivation and Processing of Potato in Bihar : Issues and Strategies

Article · October 2014

CITATIONS
9

READS
3,054

4 authors, including:

K. M. Singh
Dr Rajendra Prasad Central Agricultural University Pusa
482 PUBLICATIONS **2,168** CITATIONS
SEE PROFILE

Abhay Kumar
ICAR Research Complex for Eastern Region
156 PUBLICATIONS **573** CITATIONS
SEE PROFILE

Environment & Ecology 32 (4B) : 1647—1652, October—December, 2014
Website: environmentandecology.com ISSN 0970-0420

Cultivation and Processing of Potato in Bihar : Issues and Strategies

Tara Shankar, K. M. Singh, Abhay Kumar, S. K. Singh

Received 20 March 2014 ; Accepted 3 May 2014 ; Published online 16 May 2014

Abstract Potato is the fourth major food crop after rice, wheat and maize in Bihar. It occupies less than 5% of net sown area with production only 4th after rice, wheat and maize. Potato a short duration crop has special significance since it gives exceptionally high yields / unit area / unit time and has high nutritional value to sustain burgeoning population and ward off hunger and malnutrition. Potato produces more food, edible energy and edible protein per unit area and time as compared to any other food crop. Potato provides excellent opportunities in raising an income of the farmers as it has capacity to yield 5—10 times more than cereals, pulses or oilseeds. Efficient marketing is crucial for a successful diversification and commercialization of potato and accelerated farmer income growth. At present, marketing of potato in the state is highly unorganized. Bihar's density of the market (per m ha of sown area) is relatively low. Emphasis should be put on the establishment of new cold stores, processing industries in the production catchments to minimize transport cost, create employment opportunities in the rural sector. There is challenge to enhance productivity and quality under conditions of shrinking arable land, reduced water availability, changing climatic conditions and expanding biotic and abiotic stresses. However, with increase in production, recurring gluts are common in the country. The price crashes drastically during months of plenty, leading to distress sell by farmers and incurring substantial monetary loss. To absorb excess potato production and sustain the growth, there is need for diversified and increased utilization and export of potatoes. The paper tries to explore the current scenario, the constraints and possible solutions for enhancing potato cultivation in India in general and Bihar in particular.

Keywords Potato, Potato production, Value addition, Potato trade and marketing.

T. Shankar*
Research Associate, NAIP, ICAR-RCER, Patna, India
e-mail: taraignou@gmail.com

K. M. Singh
Principal Scientist and Head, Division of Socio-Economics and Extension, ICAR-RCER, Patna 800014, Bihar, India
e-mail:m.krishna.singh@gmail.com

A. Kumar
Principal Scientist, Division of Socio-Economics and Extension, ICAR-RCER, Patna, India
e-mail: akumar 1904@rediffmail.com

S. K. Singh
Senior Scientist, Central Potato Research Station, Sahay Nagar, Patna, India
* Correspondence

Introduction

Potato is highly nutritious, easily digestible and regarded as wholesome food having vast potential for ensuring food and nutritional security for millions of people of state. In Bihar, large population accompanied with poverty poses serious problems. These

Table 1. Area production and productivity of potato in major districts of Bihar (2009–10). Source Directorate of Horticulture, Govt. Of Bihar [2].

District	Area (ha)	Production (t)	Yield (t/ha)	District	Area (ha)	Production (t)	Yield (t/ha)
Patna	16050	409400	25.50	West Champaran	12200	201300	16.50
Nalanda	27000	653320	24.19	Muzaffarpur	12000	210980	17.58
Rohtas	10700	195100	18.23	Vaishali	13500	255040	18.89
Gaya	11500	190240	16.54	Madhubani	10600	168040	15.85
Saran	13500	249970	18.51	Samastipur	12300	250910	20.39
Siwan	10300	113460	11.01	Others	149240	2430310	16.28
Gopalganj	12200	210470	17.25	**Total**	**322840**	**5741290**	**17.78**
East Champaran	11750	202750	17.25				

problems besides having close relationship with food insecurity are also related to poor health as a result of malnutrition. Moreover, increasing population, rapid urbanization and manmade creation of waste lands is causing shrinkage of arable land and water resources. At the same time declining input use efficiency, emergence of resistant pest and diseases and declining output input ratio have resulted in making farming less and less remunerative for resource poor farmers of the state. Under this scenario, potato a short duration crop has special significance since it gives exceptionally high yields / unit area / unit time and has high nutritional value to sustain burgeoning population and ward off hunger and malnutrition. Potato produces more food, edible energy and edible protein per unit area and time as compared to any other food crop. Potato, thus, holds major potential in eradicating hunger and malnutrition and providing food and nutritional security to ever increasing population. The task before the state of Bihar is to increase the quality production of potato to meet the domestic requirements within the state and other part of the country to earn more income.

Potato production situation

India is the world's third largest potato producing country. The potato productivity in India (18.4 t/ha) is little better than world average (16.6 t/ha) however, it is much lower than many of the countries of Europe and America such as Netherlands (42.4 t/ha) because it is grown as short duration crop in India. The estimated total production in India for 2009-2010 was around 34 million tones from 1.55 million hectares. At present Bihar ranks third after Uttar Pradesh and West Bengal in potato area and production among different states of India [1]. Table 1 shows, potato is grown in 0.32 million hectare in Bihar with annual production of 5.74 million tones having productivity of 17.78 t/ha [2]. Potato is grown in all the 38 districts of Bihar, but the major contributors are Nalanda, Patna, Saran, Samastipur, Gopalganj Vaishali, East and West Champaran, Muzaffarpur and Siwan which account for 80 percent of the area. Productivity wise Nalanda, Patna and Begusarai are foremost districts. However, Bihar (17.78 t/ha) which is sandwiched between high productive states West Bengal (24.70 t/ha) and Uttar Pradesh (21.97 t/ha) has always been the concern for policy planners for its low productivity despite the fact that it is blessed with high fertile land and good quality water resources.

Opportunities, challenges and strategies

Potato provides excellent opportunities in raising the income of the farmers as it has capacity to yield 5_10 times more than cereals, pulses or oilseeds. The high profitability of potato as a cash crop has made it an economically viable enterprise for the small and marginalfarmers and has contributed to increasing equity among farmers in the sub-tropics [3]. Potato provides higher unit return and offers great scope for value addition. Potato has high employment generation potential during crop raising post-harvest handling, processing and value addition. Potato requires an input of 250 man days for cultivation of the crop in

Table 2. Average maximum and minimum temperature during crop season at different locations (mean of 30 years) (from 1980 to 2010). Source: Central Potato Research Station, Patna [5].

Region	During crop growth (°C) Average maximum	Average minimum	During crop maturity (°C) Average minimum
Amritsar	24.6	8.6	4.5
Hisar	27.5	9.7	5.5
Kota	29.1	14.4	10.6
Meerut	25.5	11.1	9.8
Gwalior	26.0	8.8	10.0
Kanpur	26.0	12.0	11.0
Indore	27.6	10.6	11.0
Patna	25.6	13.1	13.4

one hectare area. The cultivation of potato in 1.4 million hectare area generates rural employment to the level of 350 million man days annually. In addition employment opportunities are generated also in the post-harvest operations of storage, processing and value addition, transportation and marketing.

Potato crop is grown in multiple cropping systems in rotation with other vegeble or cereal crops. It responds well to input and gives high returns. The residual potash and phosphorus of the crop are generally adequate and the nitrogen requirement is reduced by half for good growth of succeeding cereal crops. Thus it contributes towards improved management of natural resources and optimization of fertilizer use which are essential for sustainable agricultural production.

There are several challenges to achieve these targets. Some of the are increasing population, decreasing arable land, reducing water availability, improved purchasing power leading to requirement of more food, reduction in input use efficiency and environmental degradation or adverse changes in climate. Since, land and water are shrinking resources for agriculture ; there is no other option except to produce more food from less land and water. In other words, we have produced more food per unit land, water, energy and time.

Table 3. Percentage of tuber dry matter in processing varieties growth at different places. Source: Central Potato Research Station, Patna [5].

Variety	Badaun	Modipuram	Patna	Indore
Kufri Chipsona–1	22.6	20.3	24.0	22.2
Kufri Chipsona-2	22.6	20.1	22.0	20.3
Kufri Jyoti	19.7	17.7	18.4	18.8

Under this scenatio some of the strategies to increase potato production in environmentally, economically and socially sustainable manner are given below:

Processing and value addition

Processing is a fast growing sector in the potato world economy. Potato can be processed in to several products like chips, French fries, flakes, dice, cubes, granules and canned potato on a commercial scale. In India only than 6% of total potato harvest is used for post harvest processing as compared to 60% in USA, 55% in the Netherlands and 25% in China. In recent years the demand for processed potato products in the country has risen at fast pace due to increased urbanization, rise in per capita income, increase in number of working women and expanding tourisen. About 90% of total potato processing in India is done in the unorganized sector which provides a lot of employment to landless, marginal and small farmers. Development of processing cultivars namely Kufri Chipsona-1, Kufri Chipsona-2 and Kufri Chipsona-3 which is now being used by the industries for making chips and French fries, has accelerated growth in processing sector. With the coming up of large companies in the potato processing sector the demand for a processing quality potato is increasing exponentially.

There appears a great potential of potato processing in Bihar since at present this is negligible. There is complete lack of processing unit and absence of any established processing facility in the

state. The produce is mostly marketed fresh with negligible processing and value addition. There are no organized processing industries in the state. Less than 1% of the potato is processed in Bihar. Some village level processing of potatoes in to chips and papad etc. is in practice in unorganized sector. The processing segment is market by a complete absence of cold chain along the value chain resulting in quality deterioration [4]. The state is not yet prepared to absorb excess potato production and thus attention need to be given for development of policies for promotng processing and exports. As a matter of the fact with proper development of markets, cold storages, transportation and processing, potato products can be marketed to other states and even to foreign countries, which will improve the farmer's income.

Unlike north India, the spell of cold winter is short in Bihar and therefore, optimum date for planting potato is mid -November and afterwards (this is also because of late paddy harvesting). Thus potato harvesting often takes place during late February to mid-March. The weather during these days is warmer. It is an established fact that weather condition supporting relatively high temperature during later phase of crop growth and at the time of potato harvest ; facilitates better quality of processing tuber with less reducing sugar and more dry matter. One can expect the dry matter content of 18—e0% when the average minimum temperature is between 10 and 12°C. When the average minimum temperature is more than 12°C, the dry matter is 20% and more, accompanied with low level of reducing sugars. Major areas in Bihar fall in most suitable category of potato production for processing. Potatoes of variety Kufri Jyoti grown at Patna have a dry matter content ranging from 20 to 21%. Generally, dry matter content above 20% is considered good. The average maximum and minimum temperature during crop growth period at Patna are 25.6°C and 13.1°C respectively (Tables 2 and 3) [5]. The reducing sugar content up to 250 mg/100 g fresh weight is considered acceptable for processing potatoes into chips.

Now awareness is increasing regarding the suitability of Bihar for producing potatoes fit for processing purposes. Potato processing companies are doing contract farming and transporting the stocks to far off places for processing. Since potato processing firms at present do not exist in Bihar, there is outflow of limited material to outside state for processing. It is very likely that firms will now be established within the state to make use of the best suited produce for processing.

Unorganized marketing and price fluctuation

Efficient marketing is crucial for a successful diversification and commercialization of potato and accelerated farmer income growth. At present, marketing of potato in the state is highly unorganized. Bihar's density of the market (per m ha of sown area) is relatively low and the amount and quality of market infrastructure and support services is also very poor. Potato crop is produced seasonally but marketed throughout the year whereas marketing facilities of potato are not adequately developed in the state. Most of potato in state is harvested during January–March. Due to lack of cold storage facility, farmer do not find adequate place to keep their produce safely. This compels farmers to reach market with all their produce at a time immediately after harvest. The causes sudden price crash during peak harvesting season and farmers are forced to sale the produce at very nominal price and not getting remunerative price. There is need to organize the marketing system to ensure better return to the growers. On the other hand price shoots up in the lean months of August—December when fresh potatoes are not available. These causes price fluctuation. The arrival of potato in the market and theprices are very varied over time which introduces elements of uncertainty that affects both producers and consumers. Due to unpredictable prices, farmers do not take proper decision about planting area and also time of the sale of their harvested potato. Gluts are more common and severe due to high potato production, causing heavy monetary losses to farmers. This discourages farmers of potato cultivation. To avoid gluts and price crash a part of production can be diverted to processing and export [6].

Infrastructure

Rural connectivity is the key to raise the farmer's income and productivity. There are problems of proper

communication and Transport in rural areas. Therefore, utmost priority should be given to improve connectivity by constructing good roads in the rural area in all districts. Linking of all production areas with all-weather roads is necessary. Creating infrastructure like grading centers, pre cooling units, cold storage, transport vehicles etc. are urgently required to reduce post-harvest losses and increase farmer's profitability.

Human resource development

For meeting the growing demands of the sector, it is necessary to have skilled man power at different levels. More over the acquired skills need to be updated periodically. Skilled man power will not only face the challenges of rapid development but also help accelerating the pace of growth of the sector. To train the man power there should proper coordination between agriculture extension institutions, state government, financial institutions and farming community. Training programs for farmer at Panchayat and Block levels should be organized on a regular basis for adopting modern technologies more effectively. Appropriate network of extension services needs to be created to stimulate and encourage both top-down and bottom-up flows of information between farmers, extension workers and research scientists.

Socio economic condition of farmer

Land holding in Bihar consists predominately of small farms and holdings with high degree of fragmentation. Majority of farmers of the state, about 86% of our farmers are small and marginal. The average size of holdings is declining, having fallen to around 0.6 ha, and majority of farmers have less than 1 ha each. High population density has pushed up the intensity of the cultivation: the total cultivated area is around 60% compared with 47% nationally. With the average size of hand holding shrinking as a result of increasing fragmentation, many marginal farms are becming economically non-viable and oriented towards subsistence. Land consolidation has not being done in the state. Farmers have their fragmented small land holdings at several locations, which restrict them to create basic facilities of irrigation, fencing and transport. So, consolidation of land in the state should be a highest priority [7].

Non-availability of genuine fertilizers and agrochemicals at right time is also a problem. Invariably phosphatic and potassic fertilizers are not available at desired time. The less use of phosphatic and potassic fertilizer results in poor yield. Reliable and timely availability of quality inputs at reasonable prices, institutional and credit support, especially for small and resource poor farmer should be given on priority basis.

Conclusion

Potato is one of the few foods capable of nourishing the population of the world. It is estimated that by 2020 India will have a population of 1.3 billion. This will require the country to produce about 49 million tonnes of potato. To achieve this production target, the productivity per unit area and time has to be increased. Adoption of improved technologies would be imperative to achieve the desire productivity level at the country as well as the state of Bihar [8]. Moreover, there is challenge to enhance productivity and quality under conditions of shrinking arable land, changing climatic conditions and expanding biotic and abiotic stresses. However, with increase in production, recurring gluts are common in the country. The price crashes drastically during months of plenty, leading to distress sell by farmers and incurring substantial monetary loss. To absorb excess potato production and sustain the growth, there is need for diversified and increased utilization and export of potatoes.

References

1. Nagara JR, Rahman A (2010) Booming Bihar: Fact or fiction. Economic and Political Weekly XLV : 10—11.
2. Directorate of Horticulture, Govt of Bihar (2010) Area, production and productivity of potato in major districts of Bihar.
3. Gulati A, Minot N, Delgado C, Bora S (2007) Growth in high-balue agriculture in Asia and the emergence of vertical links with farmers. In: Swnnen, JFM (ed). Global Supply Chains, Standards and the Poor. CABI Publ, Oxford.

4. Minten B, Reardon T, Singh KM, Sutradhar R (2011) The potato value chain in Bihar: An assessment and policy implications. IFPRI Memeo Unpublished, NAIP. ICAR-RCER, Patna, pp 51.
5. Central Potato Research Station, Patna (2010) Average maximum temperature during crop season and percentage of tuber dry matter in processing varieties grown at different locations.
6. Basu JP (2010) Efficiency in wholesale retail and village markets: A study of potato markets in West Bengal. J South Asian Development 5 : 85—112.
7. Sharma AN (2005) Agrarian relations and socio-economic change in Bihar, Economic and Political Weekly, March 5, pp 960—972.
8. World Bank (2007) Bihar agriculture: Building on emerging models of "success". Agriculture and Rural Development Sector Unit, South Asian Region. Discussion Paper Series, Rep No 4, Washington DC.