

POTATO: FOOD SECURITY IN NEPAL

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ABSTRACT

Potato, a non cereal food crop is a important food item in Nepalese diet with deviant mode of consumption as staple food in high-hills and as side dishes in other part of the country. Since the cereal grain food production is not enough to meet the country's food requirement, there is an immediate need to promote any alternative crop(s) and technology to support food security in the country for the growing population. Comparatively, potato fits best in fulfilling the aforesaid issue.

The present dietary energy supply (DES) is less by 341cal/caput/day to meet the average DES as projected by the WFS for the year 2010 (2,770 cal/caput/day), which is less by 675 cal/caput/day as calculated for Nepal. Potato and roots supply 4% of 2429 cal. which was available per capita per day during 1994/95. Potato can suppliment 2.4% of DES requirement by 2010 through adoption of true potato seed (TPS) technology in 15% of the projected area under potato cultivation. Despite the availability of more quantity of food using TPS as promising alternative means of potato production, environmental degradation and cost of cultivation can be reduced.

An appropriate policy, technology, extension approaches and involvement of the private sectors in the agriculture sector are the prerequisite factors in achieving the food security through increased potato production and better access to food.

INTRODUCTION

Food is an inevitable among the basic items to support life. Being the food is our persistence need, U.N. General Assembly in 1966 defined and formalized the right to food as a basic human right, in principal no compromise is acceptable concerning the right to food. Thus, to produce more quantity of high quality food to the growing population at the level of security is a prerequisite activity.

The food security in this paper is taken as, each and every people of the country should be assured of and access to the food required for productive and healthy life. Food security is jointly determined by availability of food and access to food (Pinstrup and Pandya-Lorch, 1994) to fulfill the daily minimum requirement of 2,770 calories per person per day by 2010 as recommended by World Food Summit (FAO,1996). The country like Nepal where 49% of the population are below poverty line and two third of them are represented by the hill population (NAPP, 1995) where hunger is the consequences of poverty, access to food by individuals is usually conditioned by income: the poor commonly lack adequate means to secure their access to food.To eliminate poverty there must be food available and access to food for all. One way to achieve this objective is to increase production at comparatively low cost and in shorter period of time. Potato falls in the category of producing high dry matter per day (Horton,1987) with high benefit ratio.

Nepal has made remarkable progress in total food production but quantity of major cereal (staple) grain production is negative in the food balance of the country.

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Although, potato is not categorized as staple in national data base but it has certainly contributed significant role in making per capita food available and supply of daily calories.

REVIEW OF LITERATURE

Nutritional value of potato: The composition of potato in terms of protein, minerals and essential amino acids makes it a wholesome food (Woolfe, 1987). One - hundred grams each of rice, wheat, maize, dry beans and dried potatoes supply, 364,332, 338 and 321 kcal, respectively. It is estimated that potato contains about 2% protein including amino acids and 100 gm potato provides about 8% of the daily minimum requirement of protein, 10% of Fe, 20-25% vitamin C, 10% vitamin B₁ and about 3% of the daily energy requirements (Beukema and Vander Zaag, 1979). The potato is an important source of nitrogen and expressed in terms of net protein utilization exceeds other plant protein (Burton,1974). On an average, Nepalese get 78.4% of their calories from grains (cereals 76% and pulses 3.42%), 5.5% from livestock products and, potato and roots supply 4% of 2429 cal. which was available per capita per day in Nepal during 1994/95 (Table 1). This was less by 91 kcal/capita/day as estimated for the developing countries in 1990/92 (Table-2) and needs additional 675 cal/capita/day by 2010 in Nepalese diet.

Table-1. Availability of food per capita per annum and calories per dium in Nepal during 1994/95 (MOA,1995)

Food items	Food		Calories	
	Kg / annum	% share	calory/dium	% share
Total of cereals	193.5	50.76	1844	75.92
Total of potato & roots	34.7	9.1	96	3.95
Total of pulse	8.97	2.35	83	3.42
Total of vegetable	56.0	14.71	43	1.77
Total of fruits	17.3	4.53	25	1.03
Total of fish and	0.87	0.23	3	0.12
Total of Livestock	55.01	14.43	172	7.08
Total of others	14.80	3.88	163	6.71
Grand total	381.18	100	2429	100.0

Source : Agriculture Statistics division, MOA/HMG, 1994-95.

Table - 2. Average per caput dietary energy supply (DES)

Countries	1969-1971	1990-1992	2010
	(calories / caput / day)		
World	2 440	2 720	2 900*
Developed countries	3 190	3 350	3 390*
Developing countries	2 140	2 520	2 770*
South Asia			2825**
Nepal			3104**

Source: * WFS, 1996, ** estimated on the basis of available data.

Importance of Potato in the Food Production: The potato (*solanum tuberosum*) is one among the four major food crop after rice, maize and wheat and ranks fourth in

food production in Nepal (MOA, 1995) and on a world scale too (CIP, 1984). The area under potato in Nepal is 106000 ha. and average yield is 8.5 mt /ha which is lower than the countries in the SAARC region (Table 3).

Table 3. Potato production and productivity for SAARC countries in 1986 and 1993 to 1996

Year	Production (000 t.) and Productivity (mt/ha.)					
	B.desh	Bhutan	India	Nepal	Pakistan	Shri Lanka
1986	1103 (10.2)	28 (9.8)	10423 (12.4)	412 (5.8)	618 (9.8)	82 (11.3)
1993	1384 (10.6)	34 (13.6)	15230 (14.4)	733 (8.4)	933 (12.28)	78 (9.0)
1994	1438 (11.0)	34 (13.6)	17392 (16.6)	780 (8.7)	1056 (13.3)	79 (8.8)
1995	1468 (11.2)	34 (13.6)	17942 (16.5)	839 (8.6)	1085 (14.0)	82 (11.0)
1996	1442 (10.8)	34 (13.6)	17942 (16.5)	898 (8.5)	1064 (13.5)	82 (11.0)

Source: FAO, 1997 (RAP). Figures in parenthesis are productivity.

In Nepal total potato production is almost doubled in 1996 compared to production of 1986 from 412 to 898 thousand mt., which shows the growth rate of 7.3% and 3.8 per annum in production and productivity respectively. The higher growth rate of potato indicates that it has tremendous potentiality to support food security in future (Table 4). The total production of cereals grains (rice, wheat, maize, millet and barley) in 1994/95 was less by 0.5 million ton to the country's grain requirement (ASD, 995).

Table -4. Average Annual Growth Rate of major food crops of Nepal during 1986 to 1996

	Average Growth Rate (1986 - 1996)						
	percent						
	Rice	Maize	Wheat	Millet	All cereals	Pulses	Potato
Area	0.7	0.5	1.2	3.0	0.6	2.2	3.4
Production	1.0	2.6	3.0	4.6	1.8	2.7	7.3
Productivity	1.0	2.1	1.8	1.5	1.2	0.5	3.8

Role of Potato in Food Security: Nepal is third among the least developed country in the world having per capita GDP of NRs. 12127 (CBS, 1997). In the coming years about 0.5 million people are expected to be added to the population annually, increasing the size by present population of 18.5 million (CBS, Nepal, 1997) to reach 23.5 million (CBS, Nepal, 1992) by 2000. Total population beyond 2000 is expected to be 29.5 million in 2011/012. (Table 5). It is estimated that 81.2 % of the active population depends on agriculture. Out of 55 districts in the hill / mountain topography 41 districts are deficit in cereal food. It is a matter of concern that the situation in hills and mountains is gradually deteriorating because of slow agricultural growth rate and it has been felt that the food supply in this area has been more difficult.

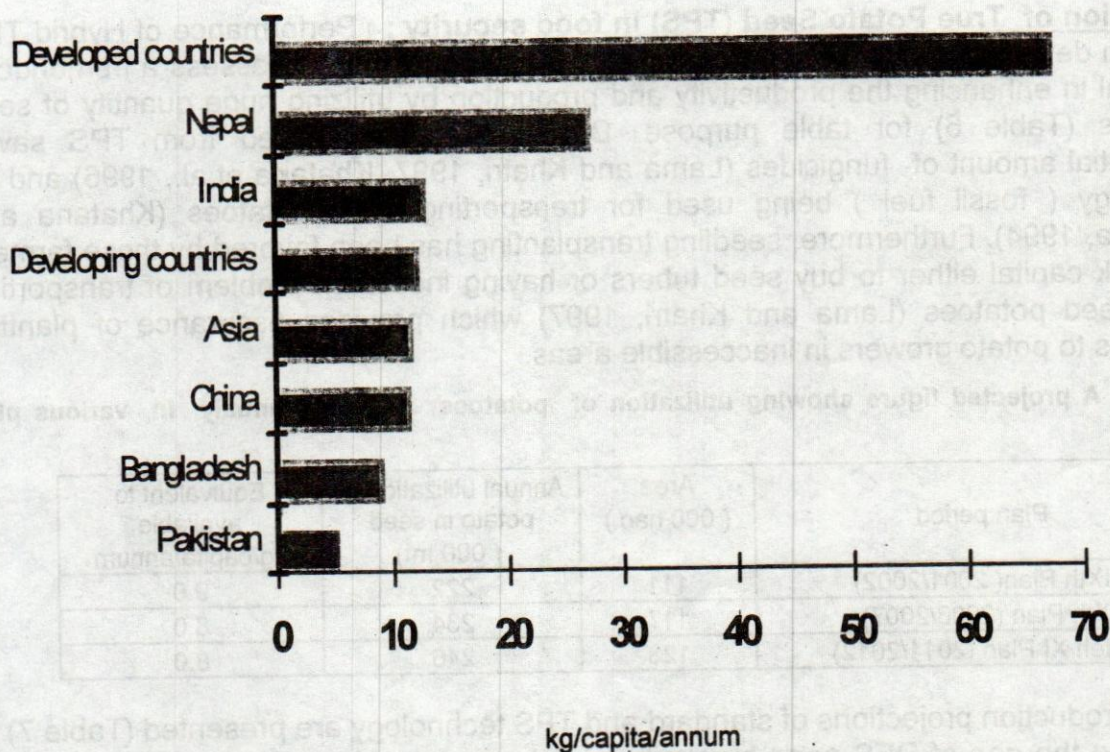
Table - 5. Population projection of Nepal beyond 2000.

Year	Population in million
1991	18.5*
2001/2002	24.1**
2006/2007	26.6***
2011/2012	29.4***

Source: CBS, 1995*, ASD, 1995**, population calculated at medium (2%) annual growth rate***.

To provide basic requirement of DES (Dietary energy supply) to the growing population, it becomes necessary to take advantage of crop(s) like potato to eliminate food insecurity and poverty. Thompson and Kelly (1957) termed potato as the world's leading food crop. Per capita consumption of potato in Nepal was 27.3 (Fig. 1.) in 1995, which is higher compared to other countries in the region. It indicates that potato possesses important role in food consumption behavior from the economic as well as social point of view in Nepal. A study shows that relatively higher net return (about 5 fold) can be obtained growing potato crop both in hills and terai condition by applying a moderate level of available technology (Shakya,1997).

Fig. 1. Yearly per capita availability of potato in kilograms (. 1991-1992 average)



Source: CIP/FAO, 1995

Thus, with these potentialities of the potato crop in food system, the potato can be taken as commodity of high priority to support food security by increasing production through increased productivity, strengthening storage capacity and its distribution in the country.

There are mainly three options to assure more potato production a) Expanding area under the crop: There is not much cultivable marginal lands left to bring under the cultivation. It was during the 1950 to 1960 that the extension of maize and millet took

place rapidly by annexing waste and possible forest lands under these crops (Macfarlane, 1976). It is also evident that increasing price of cultivated land (Conlin and Falk, 1979) reflects its scarcity due to less land of lower quality are remained for agriculture purpose and recent increasing developmental infrastructures on the high potential lands for non-agricultural purpose. b) Increase in productivity : During the past five year plans special emphasis has been given to agriculture sector to produce more food by increasing productivity and expansion of area under cultivation of major crops. At this state there is little hope to have more food from additional area under the crops like rice, wheat and maize, because of the fact that these cereal grain crops are becoming less profitable in comparison to cash crops, fruit, vegetables and forest trees. c) increase production at present level of indicators: Production can be increased assuming that other developmental indicators are not increased much by applying alternative technology in potato production e.g. True potato seed (TPS).

The first option may not help much in the long run due to environmental and socioeconomic reasons and second option needs productivity increasing technology supported by an extension system, an appropriate input supply, post - harvest requirements and adequate market environment in the rural farming community. Thus, third option which is a promising alternative technology can be considered as viable approach towards contribution of potato crop for food security.

Projection of True Potato Seed (TPS) in food security : Performance of Hybrid TPS so far in developing countries including Nepal has shown that it possess a tremendous potential in enhancing the productivity and production by utilizing huge quantity of seed potatoes (Table 6) for table purpose. Beside this, crop raised from TPS saves substantial amount of fungicides (Lama and Khatri, 1997. Khatana et.al., 1996) and lot of energy (fossil fuel) being used for transporting seed potatoes (Khatana and Upadhyya, 1994). Furthermore, seedling transplanting has been favored by those farmers who lack capital either to buy seed tubers or having incessant problem of transporting bulky seed potatoes (Lama and Khatri, 1997) which provides assurance of planting materials to potato growers in inaccessible areas.

Table -6. A projected figure showing utilization of potatoes as seed annually in various plan periods.

Plan period	Area (000 hac)	Annual utilization of potato in seed (000 mt)	Equivalent to available kg/capita/annum
End of IXth Plan(2001/2002)	111	222	9.0
End of Xth Plan (2006/2007)	117	234	8.0
End of teh XI Plan (2011/2012)	123	246	8.0

Production projections of standard and TPS technology are presented (Table 7) in narrowing the gap of DES need by availing total amount of potatoes in the food stock. Table 7 shows that DES from the beginning of the 21st century through potato will be 52.2, 56.2 and 65 kcal/capita/day at the end of 9th, 10th and 11th five year plan. Additional calories supply by TPS will be about 6, 12 and 20 at the end of above mentioned plan.

Table - 7. Projection of potato production and DES in Nepal

A: Through use of standard cultivars

Plan period	Area (000 ha)	Productivity (t/ha.)	Production	Additional	Seed use	Waste**	Balance	D. Matter	kcal/caput /day
End of 8th Plan (1995/96)	106	8.5	901	0.0	212	135	551.3	110	46.4
End of 9th Plan (2001/2)	111	9.0	1002	0.0	223	150	628.7	126	45.8
End of 10th Plan (2006/7)	117	10.0	1168	0.0	234	176	760.5	152	50.2
End of 11th Plan (2011/12)	123	11.0	1350	0.0	245	203	902.5	181	53.9

B: Through use of TPS seedling tuber (F1C1)

End of 9th Plan (2001/2)	5.3 (5%)		95	95	4.24	14	76.8	15	6.0
End of 10th Plan (2006/7)	11.13 (10%)		223	223	9.0	33	180	36	12.0
End of 11th Plan (2011/12)	17.50 (15%)		385	385	14.0	58	314	63	19.0

C: Through use of TPS (seedling transplanting)

End of 9th Plan (2001/2)	5.3 (5%)		95	95	0.0	14	81	16	6.0
End of 10th Plan (2006/7)	11.13 (10%)		223	223	0.0	33	189	38	12.5
End of 11th Plan (2011/12)	17.5 (15%)		385	385	0.0	58	328	66	20.0

* Figures in the parenthesis indicates area under TSP as of projection for standard cultivars.

** Calculated as given by CIP/FAO, 1995.

ROLE OF RESEARCH AND DEVELOPMENT

The urgency of agricultural research and development is critically felt to generate self sufficiency and access to food for apparently increasing population which lead to the establishment of technology generation and transfer system in the country. The coordinated program have been the main focus of appropriate technology generation and transfer system until now. The major technology currently available for the farmers are production technology and high quality seed. At present research and development prioritization is one of the most important policy issues in order to mobilize the scarce resources efficiently towards self sufficiency in food. The focus areas of prioritized under the R & D would be ;

- Sound, effective and stable policy
- Varietal improvement
- High quality seed production
- Productivity enhancing technology
- Development of technology in minimizing post - harvest loss
- Development of storage facilities
- Man power development
- Development of marketing network
- Create favorable environment to attract private sectors in the potato industry

CONCLUSION

Present higher growth rate in area and production indicates that there is enough room to increase productivity compared to other cereal food grain crops, which guarantee contribution of potato in food security in the future.

The role of the TPS as the planting materials in saving considerable amount of seed potatoes that are used for planting, and its genetic potential of higher productivity enhances the availability of additional food. Potato production through the use of TPS can supply additional dietary energy of 6 calories/caput/day by increase in area by 5% at end of 9th plan without increasing area under cultivation. TPS will substantially decrease the fungicide use ultimately safeguarding the environment degradation and lowering input cost of production.

Household availability of food requires that food be available at local market, which is determined by sound R & D supported by market operation, infrastructure and information flow.

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