



#### EDITORIAL

The 'Asia Brief' Series aims to inform the development practitioners and the (Swiss) public about new innovations, results and impacts of Swiss development cooperation in Asia. It particularly highlights past and present efforts to achieve aid effectiveness through partnerships between Swiss agencies and local partners. Discussion and learning from these experiences shall further enhance our motivation to reduce social exclusion and efforts to half poverty in Asia by 2015 (MDG N° 1).

Walter Meyer, Head East Asia Division

#### RESULTS OF THE BHUTAN - SWISS PARTNERSHIP

Over the last 40 years the partnership between Bhutan and Switzerland played an important role in the unique development process in this mountain kingdom. Similarities in size, being landlocked and mountainous, raised Bhutan's expectations that Switzerland would be a suitable source for experiences and technologies. The Swiss contribution towards the development process was especially strong and highly visible in the 70s and 80s, when other donors besides India had not yet established their presence in the country.

The introduction of new varieties, as well as, adapting production methods and seed production were the initial Swiss contribution to the Bhutanese potato sector. Potato and potato development had a unique impact on the livelihood of mountain farmers. During the 70s the area cultivated with potato increased by 10-20% every year and amounted to 3800 ha in 2007 compared to 760 ha in 1970. Assuming a value of CHF 5'000 per hectare, potato production contributes CHF 19 million to the Gross Domestic Product (GDP) of Bhutan or about 2%. The exceptional adoption rate is largely due to the farmers' own initiative but would not have been possible without the introduction of modern varieties and the support in seed production and marketing. The potato variety Desiree, by far the most important variety all through the last 30 years was introduced and initially promoted by the Swiss-Bhutan partnership and, therefore, locally known as "Swiss Red".



School children eating potato (*Kewa datsi*) with rice

#### POTATO IMPACT ON POVERTY AND NUTRITION

Potato is mostly produced by small farmers with landholding below the national average of 2 ha and thus contributes to an increased income of the poorer part of Bhutan's population. For many households potato is the most important source of cash income. By an increase in potato consumption and an increase in income allowing for the purchase of other essential food items, the Swiss-Bhutan partnership in the potato sector has also made a significant contribution to the improvement of human nutrition. Considering the social and cultural barriers the changes in potato consumption are remarkable. It is also interesting to note that unlike in other Asian societies today, the increase in consumption was solely based on increased availability and urbanization and evolved under a total absence of any fast food industry.

#### POTATO PRODUCERS FREQUENTLY SAY:

- Thanks to potato we are eating well
- Thanks to potato we can send our children to school
- Thanks to potato we have a permanent roof

# POTATO DRIVING ECONOMIC CHANGES

## SOCIO ECONOMIC CHANGES

In the 1950s Bhutan had no roads, no hospitals and no formal modern school system. Since then, the country has gone through tremendous changes, especially in the fields of education, communication, health and the exploitation of hydropower resources. With these changes the country is gradually moving from a society of nomads and farmers to a modern society with fast growing urban centres. Agriculture is still the single most important source of employment but the production system is gradually changing from subsistence to a market oriented system. Potato has been a catalyst for this transition as described below for Bumthang district in central Bhutan.



*Sending potato to the market*

## WHY POTATO

Originating from the highlands of South America, potato is well adapted to the Himalayan mountain environment. It is a unique crop, that can thrive under a wide range of conditions, has excellent nutritional qualities, high productivity and is versatile in its use. Many of these attributes are important for the Bhutanese conditions. Because of its wide

adaptability, potato can be grown by the yak herders at 4500 m as well as the rice farmer at 300 m. The combined effects of the superior standing in productivity, nutritional qualities and adaptability to environmental conditions puts potato on top of the list for any programme focusing on food security, nutrition and income generation.

The higher elevations of Bhutan offer opportunities for growing specialized products for the markets in the adjacent tropical regions of India and Bangladesh. This opportunity has been exploited ever since the country became accessible by road. Apple, potato and temperate vegetables produced at elevations above 2000 m enjoy good prices and provide high income to the producers.

Potato can be cooked in many different ways with meat and cheese and it is highly compatible with chilli, an essential ingredient in most Bhutanese dishes. Furthermore, potato can be easily stored. It is especially important for high altitude dwellers where it is the only fresh vegetable available throughout the winter months beside radish and turnip. The average potato consumption is estimated to be 40 kg per person compared to about 45 kg in Switzerland, 51 kg in Nepal and 25 kg or less in the rest of South Asia. The consumption is still increasing, surprisingly it is the children who specially like to eat potato.

## POTATO IS EXCEPTIONALLY IMPORTANT FOR BHUTAN BECAUSE:

1. On a per capita base Bhutan has one of the highest potato production and consumption in Asia.
2. Potato consumption is still increasing
3. Potato is an important export commodity. Perhaps no other country exports such a high proportion of the production.
4. Potato is the most widely cultivated and the most widely purchased vegetable
5. Bhutan has excellent agro-ecological conditions for potato production.

## POTATO THE MOST IMPORTANT SOURCE OF INCOME

For many regions, especially those above 2500 m, potato is presently the only economic cash crop available for both, local and export markets. At those elevations the value of potato typically represents 80% or more of the agriculture production and accounts for close to 100% of the agriculture products sold. Without potato many households would have to find off farm work to generate income and/or migrate to urban centres.

# HISTORY OF THE 'POTATO REVOLUTION'

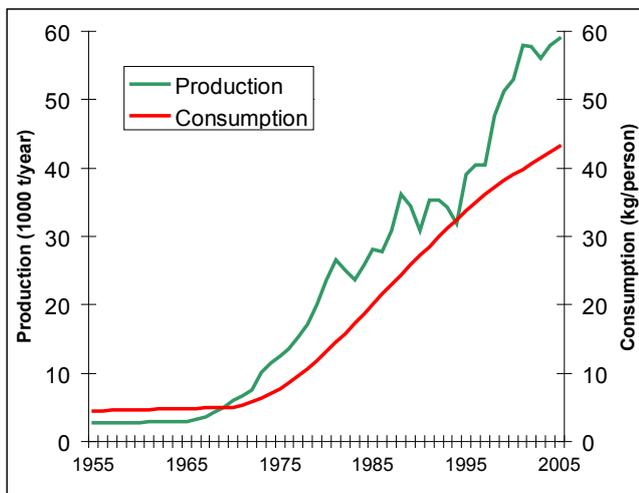


Figure 1. Trend in potato production and consumption in Bhutan (Source: Roder et al. 2008)

From the 2007 harvest farmers received about 0.3 CHF/kg and sold potato for an average of CHF 1'000 per household. Influenced by the market in India, the prices received by potato farmers in Bhutan are almost equal to those received by the Swiss producers.

## DEVELOPMENTS IN BUMTHANG DISTRICT

For many years the Bumthang district in central Bhutan was the centre of the Swiss partnership in agriculture and rural development. The economic changes in this district have been documented in detail through a series of socio-economic studies which illustrate the story of potato. The impact of potato was similar in other parts of Bhutan.

The Bumthang district became accessible by road in 1973. In 1987, only 15 years after the road was opened, 50% of all households in the district cultivated potato for sale. Potato had an immediate impact on the household income with high contribution towards the cash income. In the

1980s potato was for many households the only source of cash income and for a large proportion of the households (57%), potato was the first farm products ever sold for cash. Prior to the introduction of potato as a cash crop, the agriculture production was mostly used for subsistence with occasional bartering of goods in a largely non monetised economy.

At the same time potato production has led to high inputs of mineral fertilizers. We also notice a gradual shift towards livestock, especially milk and other dairy products. This trend is likely to continue. Potato and livestock production complement each other well as potato should not be cultivated continuously on the same field.

Changes in production system and marketing of products in Bumthang district

| Parameter   | Year |      |      |
|---|------|------|------|
|   | 1970 | 1988 | 2000 |
| Households (hh) planting potato for sale (%)                    | 0    | 46   | 59   |
| Contribution of potato to farm products bartered or sold (%)    | <5   | 79   | 54   |
| Contribution of livestock to farm products bartered or sold (%) | >50  | 16   | 46   |
| Mineral fertilizer used per household (kg/hh)                   | 0    | 253  | 276  |
| Quantity of potato produced per household (t)                   | <0.1 | 2.87 | 3.38 |
| Cash income from potato (CHF/hh)                                | 0    | 175  | 360  |
| Cash income from potato (% of total hh income)                  | <1   | 25   | 21   |
| Potato consumed (kg/person/year)                                | <5   | 20   | 50   |



Farmer in Shinier, Bumthang district (3000 m). Her sole cash income is from potato

# HISTORY OF THE 'POTATO REVOLUTION'

Potato was most likely introduced to Bhutan through India in the 18<sup>th</sup> century but was of little importance up to the 1970s.

The most important factors that contributed to the success of potato were the availability of a favourable production environment next to a large market potential. Other factors contributing to the success are mostly related to the introduction of potato, potato varieties, market accessibility/modalities and the provision of healthy seed.

## Events/factors contributing to potato development

| Events  | Year | Effect  |
|---|------|---|
| G. Bogle plants potato                                      | 1774 | Potato became known to bhutanese                      |
| Road construction   | 1960 | Access to the Indian market                           |
| Government structure  | 1960 | Basis for an advisory service and input supply system |
| Modern varieties introduced (SLB, Desiree, Maritta)         | 1970 | Basis for high yields                                 |
| Market support through the Food Corporation of Bhutan (FCB) | 1973 | Builds confidence that a market is available          |
| Registered seed producers, down hill movement of seed       | 1975 | High seed quality at moderat cost                     |
| Auction yard system   | 1980 | Efficient marketing system                            |

## CONTRIBUTION BY SWISS PARTNERSHIP

In the initial phase (1970-85) the contribution was mostly in the fields of variety introduction (Maritta and Desiree), adapting production methods and seed production. First seed production systems with registered growers were introduced by the Rural Development Project Bumthang in 1975. In the second phase the focus shifted to capacity building in research and extension. Projects within the Swiss-Bhutan partnership with major contribution to potato development included the Rural Development Projects in Gogona (Wangdue district) and Bumthang (1968-1985), The CIP Country Programme (1981-87), The Bhutan National Potato Programme (1983-96), and the Support to the Research System (1996-present).

## PRODUCTION ENVIRONMENT

The temperate climate in the elevation range of 2500-3500 m provides excellent conditions for rainfed potato production with limited pest problems except for late blight. Farmers can produce seeds of high quality and store the seed for the next season. In this regions most of the potato production takes place in traditional wheat-barley-buckwheat growing areas with moderately fertile soils.

Environments below 2500 m are less favourable with problems in seed storage, insect problems and risk of moisture stress. At these elevations potato is mostly cultivated in maize intercropping systems or in rotation with rice. The maize intercropping system offers a range of advantages for small holder farmers especially: Increased productivity, improved soil conservation, reduced risk and increased food security. All production systems are highly labour intensive as most of the work except field preparation is done manually. Labour cost account for almost 50% of the production cost (much higher compared to Switzerland). Small plots, sloping land and the widely used maize intercropping system limits the opportunities for mechanized production. The high labour requirement is further amplified by the requirements for guarding fields against wildlife crop damages.

Technologies developed through the Swiss partnership, such as the introduction of simple bullock drawn equipment and the use of herbicide, resulted in a reduction of labour for planting, earthing up and weed management.

## EXCELLENT MARKET

Bhutanese potato growers are fortunate in that their peak production coincides with peak prices in India. Potato cultivation in the neighbouring Indian states of West Bengal and Assam is generally limited to the winter months with the first crops harvested in December and the bulk harvest in February. During the summer and autumn the only potato available are those from cold stores. Fresh potato produced in the hills of Bhutan thus receive a premium price. In addition there is a fast growing requirement of fresh tubers by the processing industry.

### Potato prices and production cost

|                            | Bhutan | CH   |
|----------------------------|--------|------|
| Farm gate price (CHF/kg)   | 0.30   | 0.45 |
| Retail price (CHF/kg)      | 0.50   | 1.50 |
| Production per workday (t) | 0.01   | 1.3  |
| Production cost labour (%) | 48     | 40   |

# POTATO A MAJOR EXPORT COMMODITY



*Farmer in Bumthang earthing up potato, using simple technologies developed by the Swiss supported Rural Development Project*

Currently about 40-50% of the marketable potato are exported to India. Most of them are sold through auction.

## FROM YAK TAILS TO POTATO

Yak tails (used as fly whisks) and ponies were the most important export products from Bhutan in the 18<sup>th</sup> century. At that time the most likely export commodities were products with high value per unit weight or commodities which could walk to the market (ponies). Anecdotal evidence suggests that already in the 19<sup>th</sup> century potato was carried to Indian markets from production areas 2-4 days walking distance from the border. Export of appreciable quantities was, however, only possible when the Indian markets became accessible by road in the late 1960s and early 1970s. Within a very short period potato became a top export commodity. In some years during the early 1980s potato generated up to 10% of the total export earnings and was the 4<sup>th</sup> most important export commodity after cement, timber and oranges.

Since then hydropower and a few industrial products have pushed potato further back but it remains an important export commodity. In 2007 the value of potato auctioned was Ngultrum (Nu) 227.49 million (about CHF 6.5 million).

## INFLUENCING POTATO PRODUCTION BEYOND THE BORDER

Potato is a very important crop in the neighbouring Indian states of Assam and West Bengal, as well as in Bangladesh. In these regions seed production is difficult due to vi-

rus and bacterial wilt problems. Major sources of seed are Punjab for West Bengal and the Netherlands for Bangladesh. At the same time much of the potato growing areas of Bhutan have excellent conditions for seed production with no bacterial wilt and low virus vector presence. Seed produced in Bhutan will not only provide a cheaper source planting material for the fellow potato producer but also reduces environmental effects due to transportation. The Bhutan Potato Development Programme is making concerted efforts to exploit these opportunities.



*Trucks with potato in the auction yard*

# PARTNERSHIP WITH SWITZERLAND IN AGRICULTURAL RESEARCH AND DEVELOPMENT



*Inauguration of the Applied Research Centre Yusipang 1989 (from the right to left, Secretary General Helvetas, Director General Department of Agriculture, High Lama, Resident Coordinator SDC/Helvetas, monks and staff of the research centre)*

## ROESTI AND KEWA DATSI

The preferred and most widely eaten potato dish in Bhutan is *Kewa datsi*, a preparation with cottage cheese, chilli and potato, quite different from the traditional Swiss recipe *Roesti*. Similarly, agriculture production methods, problems faced by the producers, research priorities and research methods are generally very different. Yet, some of the experiences and the expertise of Switzerland are useful for Bhutan, especially in fields such as integrated production in mountain environments, research methodologies and potato seed production. Similarly, experiences in providing social infrastructures to remote mountain regions and addressing disparity between rural and urban centres may be useful. The on-going SDC projects in social forestry and construction of suspension bridges are examples in addressing disparities and providing social infrastructures.

## SWITZERLAND AND THE INTERNATIONAL CENTERS FOR AGRICULTURAL RESEARCH

The Consultative Group on International Agricultural Research (CGIAR), established in 1971, promotes sustainable agricultural growth through research aimed at benefiting the poor through stronger food security, better human nutrition and health, higher incomes and improved management of natural resources. The partnership between Switzerland, the International Potato Centre (CIP) and the Government of Bhutan is a typical example of the Swiss commitment to the CGIAR. With the support of Switzerland, CIP initiated a country programme in Bhutan in 1981. Since then CIP has been a major source for potato varieties, expertise and information for all aspects of potato research and development in Bhutan. The International

Potato Centre located in Lima (Peru) is close to the centre of origin of the cultivated potato and maintains the world's largest collection of potato germplasm and is, thus, the best source for material with specific properties such as late blight resistance.



*Kewa Datsi*

## SWISS-BHUTAN PARTNERSHIP TODAY

SDC and Helvetas are building on the success of the 'Potato Revolution' and actively participate in research and development of the livestock, agriculture and forestry sectors. These partnerships contributed towards capacity building in physical and human resources and the direct implementation of research and development activities. They will continue, with emphasis on:

- Social forestry and suspension bridges
- Rural development and governance

# SOIL EROSION AND WILD BOARS

## CULTIVATING POTATO IN MOUNTAIN ENVIRONMENTS

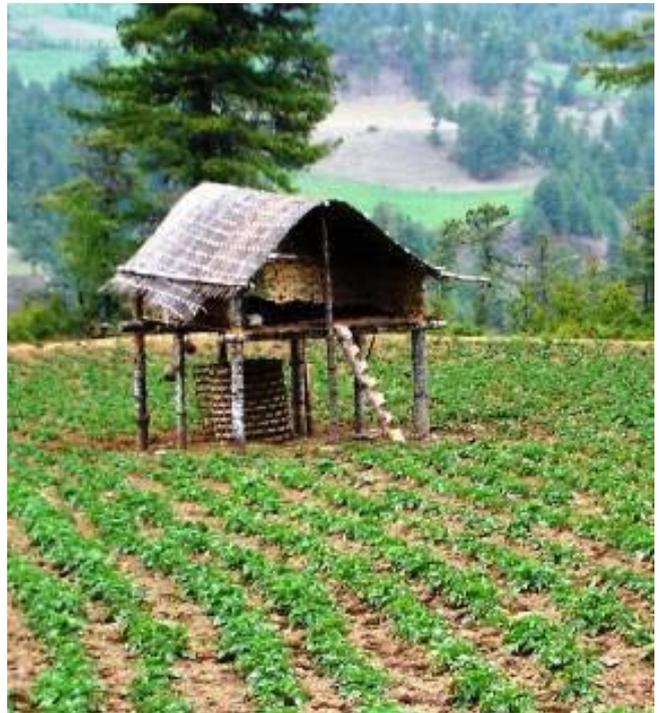
Erosion and runoff losses of nitrate (N) and potassium (P) are serious problems for all agriculture activities in mountainous environments. Potato cultivation is a high input system generating high yields and consequently removing substantial quantities of soil nutrients. Potato cultivation in a mountain environment thus requires special attention to soil fertility and conservation.

The experiences in Bhutan with intensive potato cultivation by small holders, for the past 40 years however, show that potato cultivation can be sustainable. High inputs of organic fertilizers, intercropping with maize, mulching with crop residues, planting in heaps are some of the strategies used by Bhutanese producer to maintain fertility and minimize soil erosion.



Grading and packing potato

Yet, to increase and sustain potato production there is a need to improve nutrient management with major focus on minimizing the need for in-organic fertilizer inputs and losses of N and P. The challenge is to maintain or improve soil fertility and to maintain or increase production while at the same time minimizing environmental impacts. For this innovative, pragmatic and unconventional soil fertility management and soil conservation, strategies need to be developed by the mountain potato farmers for the mountain farmers. Some of the most promising components include: irrigation management, strip cropping, minimum tillage, rotation with legumes, mulching, low input technologies and organic agriculture.



Typical hut for guarding against feral pigs

## THE MENACE OF THE FERAL PIG

Potato producers consistently cite wildlife damage and cost of protection from wildlife damage as the most important constraints to potato production. Labour, the second most important constraint, is also related to wildlife problems as guarding the field is the most important labour requirement. In 2005 an average household spent 73 nights watching the potato field. The feral pig, a hybrid between the domesticated and the wild pig is the cause for most of the problems of potato producers.

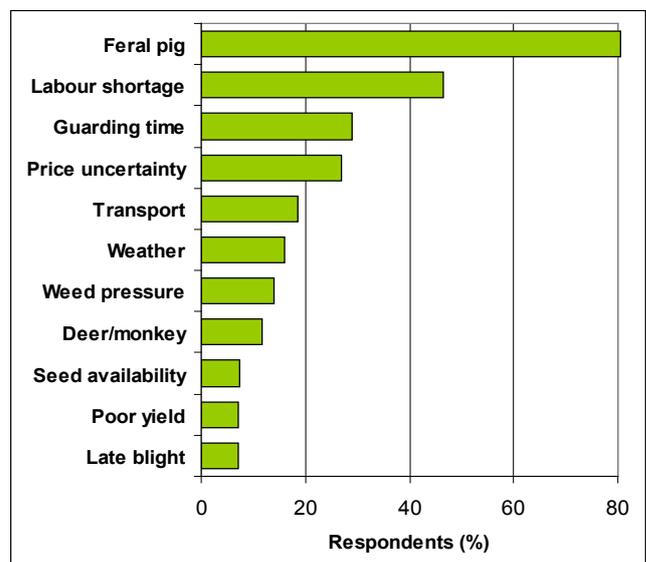


Figure 2. Constraints to potato production. Most quoted answers given by the respondents.

# FUTURE CONTRIBUTION OF POTATO

## ON THE ROAD TO DEMOCRACY

The year 2008 is a historical milestone for Bhutan as the country introduces a constitution and a democratic political system. For democracy to function smoothly it is important to empower the rural communities to participate and to articulate their needs and expectations. Potato growers have started to organize themselves in groups to optimize benefits from seed production, quality control in seed production, facilitate marketing and improve access/supply of inputs. These developments will make a significant contribution towards the objectives of governance and the participation of the rural population in the democratisation process.

## FUTURE OPPORTUNITIES

The prospects for marketing potato produced in Bhutan are very good. The requirements of the domestic markets are expected to increase by about 7-10% annually due to population growth, the fast growing urban population and the overall increase of consumption levels. Similarly, potato from Bhutan will continue to enjoy an excellent market in India. Given the large population with a fast growing middle class there will be strong demand for high quality fresh potato.



## POTATO TO CONTRIBUTE TOWARDS DEVELOPMENT OBJECTIVES

The fast adoption rate of market oriented potato production and the rapid changes in potato consumption are both examples which demonstrate how mountain societies can respond rapidly to new opportunities and new situations.

Based on the outstanding success in the past and the perceived opportunities, farmers, planners and policy makers expect that potato will make a major contribution towards achieving the objectives of the government in reducing poverty, generating employment and rural income and reducing the rate of migration. How far these expectations can be realised will depend on:

- The economic benefits available to potato producers. For this it will be important to improve yields, labour productivity, address wild life issues and optimise market opportunities.
- The ratio between economic benefits and level of expectations by the rural population. With a fast increase in the economy and fast increase in the income levels for urban households the expectations of rural households are increasing too. For potato producers in less favourable situations (slope gradient, weed population, market distance) the potential income may soon be below the expected threshold.
- Ecological sustainability of potato production.

It would be unrealistic to expect that potato could continue the trend of bringing spectacular socio-economic impact and change. In fact with a continuous decline of the agriculture sector contribution to the economy, the relative importance of potato for Bhutan's economy will diminish. Yet, even in the future potato will continue to play an important role addressing poverty, income generation and rural enterprise development.

## ABOUT THIS PUBLICATION

by SDC, Swiss Agency for Development and Cooperation, East Asia Division, Freiburgstrasse 130, CH-3003 Berne

Photos: Walter Roder

Copies can be ordered from [eastasia@deza.admin.ch](mailto:eastasia@deza.admin.ch) or downloaded from [www.deza.admin.ch](http://www.deza.admin.ch)

Further reading: Roder W., K. Nidup, and G. Chettri, 2008. The Potato in Bhutan. Bhutan Potato Development Programme, Thimphu.