

# Cost benefit analysis of the Mongolian Potato Project (MPP), 2004 – 2014

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## Introduction

The Mongolian Potato Project (MPP), funded by the Swiss Agency for Development and Cooperation (SDC), started in 2004 and ended in 2015. It was implemented by the Mongolian Farmers' Association for Rural Development (MFARD), in close cooperation with the Ministry of Food and Agriculture (MoFA). After 11 years, the final evaluation of the project took place in March 2015. One of the questions raised in this review was the assessment of the contribution of the MPP to the Mongolian economy during the project duration. This article presents the results of a Cost Benefit Analysis that attempts to answer this question.

### 1. The MPP in brief

The declared objective of the MPP was to revitalize the Mongolian potato sector (after a severe decline of the production in the early nineties, along with the collapse of the Soviet system) in order to increase domestic potato production, and to cover the demand with locally produced tubers all year round. The key achievements of the project during these 11 years including the establishment of a potato seed system in Mongolia, comprise the following: i) many potato varieties were imported and tested, mainly from Europe, but partly also from America, Russia and China ii) seven varieties have been officially released and registered; iii) the production of mini-tubers in two State funded research institutes; iv) a seed company has been supported for the production of basic seed for the entire country; v) a network of formal and informal seed growers has been set up; vi) the production technology has been improved; vii) storage facilities have been developed. Since 2012 the domestic demand – which has more than doubled during the project period, from 31kg in 2004 to 86kg/capita in 2012 – is almost fully covered with Mongolian potatoes, and the yearly production has reached more than 160'000 tonnes since 2010 for an area of approximately 13'300 ha.

### 2. Cost Benefit Analysis applied to the MPP

The ex-post CBA covers the period 2004 – 2014. The method was applied in line with the practice of SDC (SDC How-to-Note, Financial and Economic Analysis of Projects with a focus on Cost Benefit Analysis (CBA) and Cost Effectiveness Analysis (CEA), SDC 2014). The discount rate used was 10%.

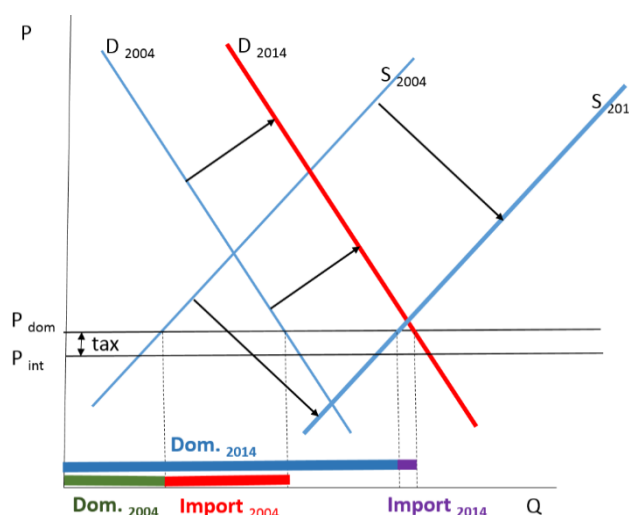
Table 1 shows the 5 steps of the CBA and introduces the main parameters of the analysis. Some additional information is given after the table, especially concerning the costs and the benefits considered in this study, and how they were calculated.

**Table 1** The 5 steps of CBA applied to the MPP

Steps	In the Mongolian Potato Project ...
<b>1. Define the boundaries of the project to analysed</b>	The system is Mongolia and covers the entire potato sector, i.e. the seed production and the consumption potatoes. It is an economic analysis
<b>2. Impact hypotheses</b>	The revitalization of the potato sector generates increased production (through improved varieties and quality seeds), and an increased consumption of potatoes in the country through improved supply of fresh potatoes of Mongolian origin
<b>3. Analysis of project costs and benefits</b>	
3a. COSTS	SDC funds: project costs (all the costs related to potatoes during the project period) MoFA contribution to the potato sector (e.g. research institutes PSARTI, RIPP) Farmers' production costs : additional costs for increased potato production (area expansion and intensification of potato cropping with more inputs) Government of Mongolia (GoM): economic costs of the import tax (potato price in Mongolia is higher by 15%)
3b. BENEFITS	Value of increased production; Value of reduced imports; GoM import tax revenue
<b>4. Data availability, data collection</b>	No additional data collection was done, the CBA is based on existing data, where no data exist, assumptions are formulated
<b>5. Set up CBA model</b>	The CBA model is established using the information from steps 1 to 4. It is an economic CBA, with the aim to assess the impact of the project on Mongolia's welfare

## 2.1 Theoretical background of the potato market in Mongolia

As shown in figure 1, in 2004, the domestic production covered only about half of the domestic demand (Dom.<sub>2004</sub>), the other half of the demand was covered by imports (Import<sub>2004</sub>). Between 2004 and 2014, there was a gradual increase of the potato demand (shift of the demand from D<sub>2004</sub> to D<sub>2014</sub> that was mainly due to the increasing urbanisation of Mongolia (increasing number of urban consumers, changing consumption habits). In the meantime, the MPP has boosted the potato production, illustrated by the shift of the supply curve from S<sub>2004</sub> to S<sub>2014</sub>. With this evolution, the demand in 2014 is covered to more than 95% by domestic production (Dom.<sub>2014</sub>) while imports represent less than 5% (Import<sub>2014</sub>). The import tax of 15% was apparently levied since 2004, but with the increasing consumption of potatoes, the economic impact of this tax has increased (the domestic price is higher by 15%, this represents a cost for Mongolian consumers).



**Figure 1** Supply and demand diagrams for fresh potatoes in 2004 and in 2014

### 2.2 Detailed information about the costs

The SDC project costs include all the costs paid by SDC that can be attributed to the potato sector. Project implementation costs are also included, but not the costs of the SDC coordination office in Ulaan Baatar, neither cost that might have occurred at the SDC headquarters in Switzerland.

The costs borne by the MoFA include mainly infrastructure and personnel costs for PSARTI and RIPP research institutes.

Additional costs for potato production: these costs are paid by the potato producers. For each ha of additional potato area (compared to 2004), the amount of 5'748'500 MNT/ha was calculated. This figure was estimated in 2014 when the CBA on seed potato production was elaborated (see CBA report MPP 2014). For the existing potato area (situation in 2004) we assumed additional costs of 350'000 MNT/ha mainly related to seed potatoes and fertiliser.

Finally, the GoM, with its import tax of 15% on potatoes, increases the potato price on the domestic market. In the present case, we calculated the price increase (+15%) on the additional potato quantity consumed compared to 2004.

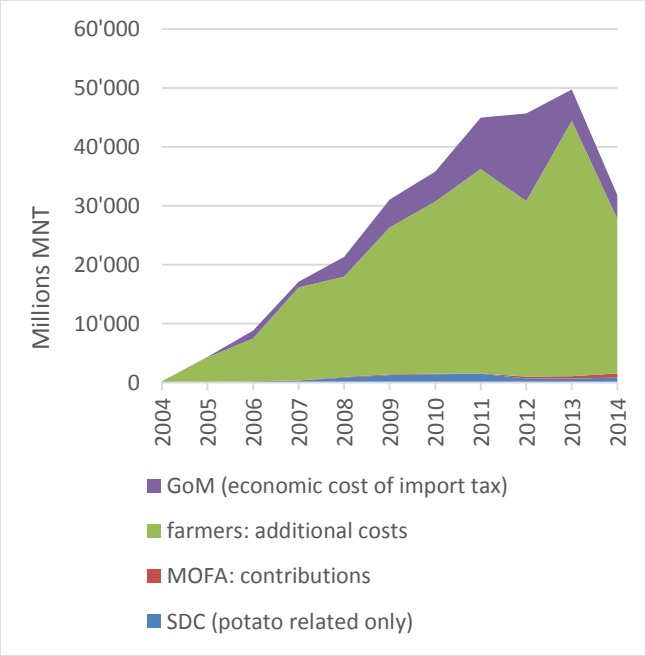


Figure 2 Additional costs in the Mongolian potato sector, from 2004 to 2014.

Figure 2 shows the additional costs in the potato sector since the beginning of the MPP in 2004. The figure clearly shows that farmers are by far the main contributors, followed by the consumers (additional quantity of potatoes paid 15% more than the market price). In comparison, the contributions of MoFA and SDC appear very modest (table 2). Another way of interpreting these figures is to say that with a comparatively modest amount, SDC and MoFA have created the framework conditions that have convinced a large number of farmers to invest more in the potato crop. In other words, this money was very well invested!

Table 2 Costs by origin during the 3 project phases (in MNT)

	2004-2007	2008 - 2011	2012 - 2015
Farmers (add. costs due to area increase and more expensive inputs)	27'235'770'000	105'837'260'000	99'393'222'000
MN economy (domestic costs of import tax)	2'375'826'120	21'863'315'100	24'169'846'524
SDC contributions to MPP	878'775'906	5'011'970'933	2'225'345'571
MoFA (mainly contribution to PSARTI)	23'469'100	414'440'800	1'414'396'280

### 2.3 Detailed information about the benefits

The main benefit is the value of the additional potato production. The value was calculated as follows:

- i. Potatoes used on the farm, as seeds or for household consumption: this quantity was valued at the farm gate price
- ii. Potatoes marketed: a share of the production between 30 and 35% was estimated in this category that was valued at the retail price.

- iii. Surplus potatoes marketed at a low price (this was based on the bad experience of 2012, where a large amount of potatoes either remained unsold or sold at a very low price).
- iv. 10% of the potato harvest was considered as waste, with a value of 0.

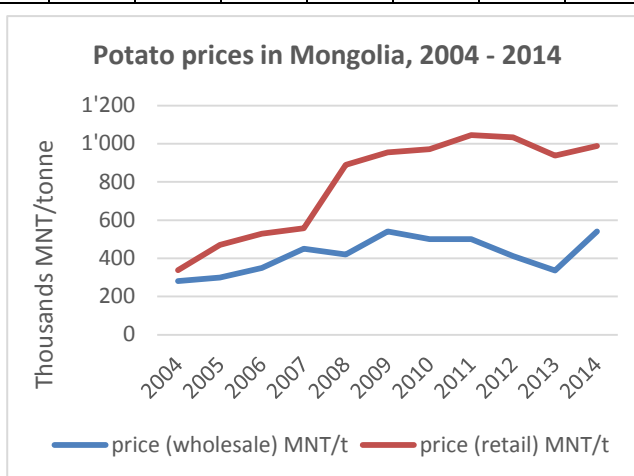
On the side of benefits, the following assumptions have been made:

The value of potatoes was estimated in different categories, namely potatoes for own use (seed and consumption), potatoes for the market (retail price), potatoes for the market (low price), and losses (value = 0) (table 3).

**Table 3** *Estimated share of potato production per category of use*

	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
% for own use	47%	48%	40%	41%	33%	33%	32%	30%	22%	32%	32%
% for market	30%	30%	35%	35%	35%	35%	35%	35%	35%	35%	35%
% surplus (low price)	13%	12%	15%	14%	22%	22%	23%	25%	33%	23%	23%
% losses	10%	10%	10%	10%	10%	10%	10%	10%	10%	10%	10%

The prices considered are based on the information obtained from the MPP, as illustrated in figure 3. We assumed that the wholesale price corresponds to the farm gate price, as we did not have more detailed information. It is interesting to observe that there was a growing gap between the wholesale and the retail price, and this supports what many farmers met during the review mission mentioned: “middlemen are very powerful and farmers get a low price for their potatoes”. However, middlemen are important stakeholders, and they are often also involved in the storage of the potatoes. Storage costs explain also partly the gap between the wholesale and the retail price.



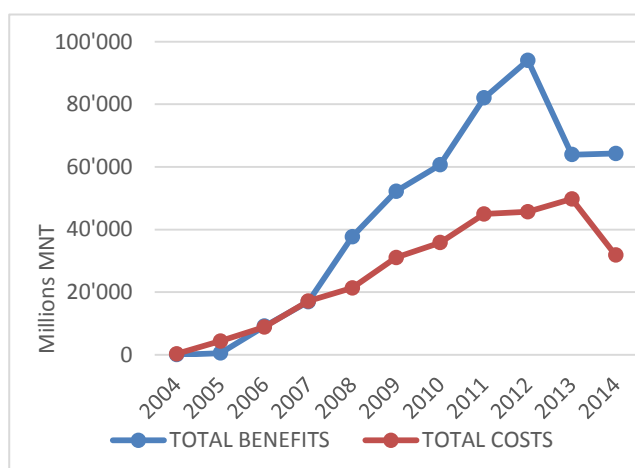
**Figure 3** *Wholesale and retail price of potatoes in Mongolia, 2004 – 2014*

For a refined analysis of the benefits, it would be necessary to analyse the prices on a monthly basis as seasonal fluctuations are very significant in Mongolia.

## 2.4 CBA results

The CBA model (developed on Excel, figure 4), in its basic version, has a highly positive Net Present Value (discounted at 10%), while the internal rate of return (IRR) exceeds 100%. Different sensitivity analyses were done to identify the most critical factors that influence this result.

The production costs per ha for increased potato cropping were rather high (over 5.7 million MNT/ha) is probably too high, and the increased production costs for the existing potato area of 0.35 million MNT/ha is also rather high. Reducing these two factors would make the result even better.



**Figure 4** *Additional costs and benefits in the Mongolian Potato Sector, 2004 – 2014, compared to the situation in 2004*

The attribution of the benefits to the MPP is calculated as 100% in this variant. In other words, we assumed that the revival of the potato sector is entirely due to the MPP. However, this may be a too optimistic view. If we assume that 70% of the benefits can be attributed to the MPP, then the NPV (10%) falls from 94 to 19 billion MNT and the IRR falls from 110% to 39%. If the attribution of benefits to the MPP is only 60%, then the NPV (10%) as well as the IRR become negative (table 6). However, considering the central role of the MPP in the potato sector in the past decade (no other project of importance has supported potato cropping in Mongolia during that time) an attribution of only 60% would definitely be too low. A realistic assessment would place the attribution at least somewhere between 70 and 80%.

**Table 4** Sensitivity analysis, for different % of attribution of benefits

attribution of benefits	100%	70%	60%
Net Present Value (NPV(10%))	94'740'950'895	19'485'647'110	-5'599'454'152
Internal Rate of Return (IRR)	110%	39%	-3%

**2.5 Interpretation of the CBA**

The results of the CBA are very positive (considering an attribution of benefits of more than 70%, see previous section), and the result is quite solid considering the sensitivity analyses. On this basis, we can say that the MPP was well targeted, and addressed strategic issues for the potato sector. With comparatively small investments, both SDC and the Ministry of Food and Agriculture have induced a very sizeable growth in this sector, i.e. the project and the improved framework conditions for potato cropping in Mongolia have convinced many farmers to invest in that crop.

**3. Conclusion**

The positive CBA results are only one aspect of the reality, and the project review shows that it would be wrong to conclude about the project success only on the basis of this CBA. Other factors, such as the sustainability of the results, with technical, but also institutional and organizational dimensions, are also crucial elements that need to be considered. In the case of the MPP, the review identified a few critical factors that need to be strengthened to ensure the sustainability of the results: the seed market on the one hand, and the storage, processing and marketing of consumption potatoes on the other hand (see also review report for full information).

However, if the CBA results had been negative, then the entire review would have looked negative. In that sense, a positive CBA is a necessary but not sufficient condition for a positive project review.