



Science

AN ECONOMIC ANALYSIS OF PRODUCTION, MARKETING AND VALUE CHAIN OF POTATO IN BAMYAN PROVINCE

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Abstract

The present study on “An economic analysis of production, marketing and value chain of potato in Bamyan province” undertaken for studying the trend in production, productivity, marketing, value chain, cost of cultivation and problems faced by the farmers in production and marketing of potato. In Bamyan, potato is an important cash crop and source of income of agriculture production. Potato is emerged as an important vegetable crop for Yakowlang district of Bamyan province, with better productivity. Therefore, a study of economics of cultivation, marketing, value chain in Yakowlang district was undertaken.

For this study, Yakowlang district and Bamyan center selected because of high level of production. In this study 126 farmers were selected from six villages, three for each district (Bamyan and Yakowlang). Relevant information was collected from the potato producer to know the economics of potato cultivation and analyzed according to various cost concept used in farm management studies. Cost of cultivation of potato calculated from the primary data collected from purposively selected grower of potato of Bamyan province.

According to study, using gross margin analysis, net margin of farmers as average is around 134243 AFN per Hectare and according to production and yield of different potato varieties in Bamyan, Kabul and Panjsher provinces. Loura variety give highest yield in Bamyan province i.e. 65.37 Ton per Hectare and similarly in Kabul Amany Variety give highest yield that is 45.71 Ton per Hectare and finally Panjsher province is a major producer of potato in Afghanistan also Amany gives highest yield that is 51.67 Ton per Hectare.

Similarly, marketable surplus of three different category of farmers, small farmers are around 88.4 percent, medium farmers were 92.68 percent and large farmers were around 90 percent had marketable surplus. Also major constraints with the farmers in potato production, and marketing ranked first was price instability, followed by high storage charges, uncertainty of water, inadequate marketing facility and spoilage of potato.

Keywords: Bamyan Potato Production; Marketing and Value Chain.

Cite This Article: Ghulam Honaryar. (2019). “AN ECONOMIC ANALYSIS OF PRODUCTION, MARKETING AND VALUE CHAIN OF POTATO IN BAMYAN PROVINCE.” *International Journal of Research - Granthaalayah*, 7(10), 1-25. <https://doi.org/10.5281/zenodo.3521976>.

1. Background

Bamyan, is one of the remote province of Afghanistan which located in central highland; majority of people income fall only in agriculture and livestock, farmer are working in a traditional way, working very hard in the summer due to cold winter to store and harvest crops from the cultivated farm for one year expenditure and could sell some for buying the cloths and other necessary commodity for their families, they are not able to have saving for their children education and medical treatment for them so this cause to continue their life in a same manner which inherited from their parent and even ability to think of changes due to economical barrier for implementation of modern and mechanized agriculture system, we can say that there are a few funder organization which help the farmer through Ministry of Agriculture, Irrigation and livestock (MAIL) and local NGOs to reform the seeds of the agricultural product and market them but this digits are very few than the required need community farmer, one of the most usual, preferred and economically beneficial to Bamyan farmer is potato that people cultivate almost 50% of their farm.

The Bamyan, farmers are striving for the seeds collection, cultivation, harvesting, storing and marketing of the potato because of the cold weather, short summer, lack of reformed seeds, lack of irrigation water, lack of fertilizers, go down, machinery, distribution channel and show room for marketing of their harvest so this all problems gives hand in to hand and create a big challenges in villager and farmer way that prevent the inventive and creative way for the whole potato life cycle from production, storage, process and marketing so this hurdle need to be eliminated by an integrated approach to respond and solve this problem of needy farmer.

Bamyan is land locked province that most of Bamyan's population work in agriculture sector (86%, NRVA 2007-8) and animal production and agriculture play an important role in their economy. Among agricultural production, potato is an important crop that farmer can get higher income from their production. But these farmers have a lot of problems in processing, marketing and clear understanding that how, and where to market their production. This research will help them in better production, processing and marketing skill for farmers, and traders.

The study will be of great benefit to researchers and policymakers as well as those actively concerned in the trade. It is intended that complementary studies will be undertaken in due course on such matters as the operation of wholesale markets and postharvest technology so that full information is available on which to build a more effective market structure, to the advantage of producers and consumers and the economy in general.

This research aim is to identify the potential market of the Bamyan, potato, production productivity and process how to modernize potato cultivation to optimize the potato production which; increase the level of farmer harvest in Bamyan, region which ultimately cause the economic growth and community welfare.

Hence to identify the cause of this problem why they are not able to come up and grown up local business network that can increase the crops, store them and market it through a distribution channel directly to end user to double the income and dominate the market themselves by empowerment of the village farmer. So this research must give up a glance of the potato cycle

from a holistic point of view from production, process and marketing of Bamyan, potato. By concentrating to the center of Bamyan, and Yakowlang districts.

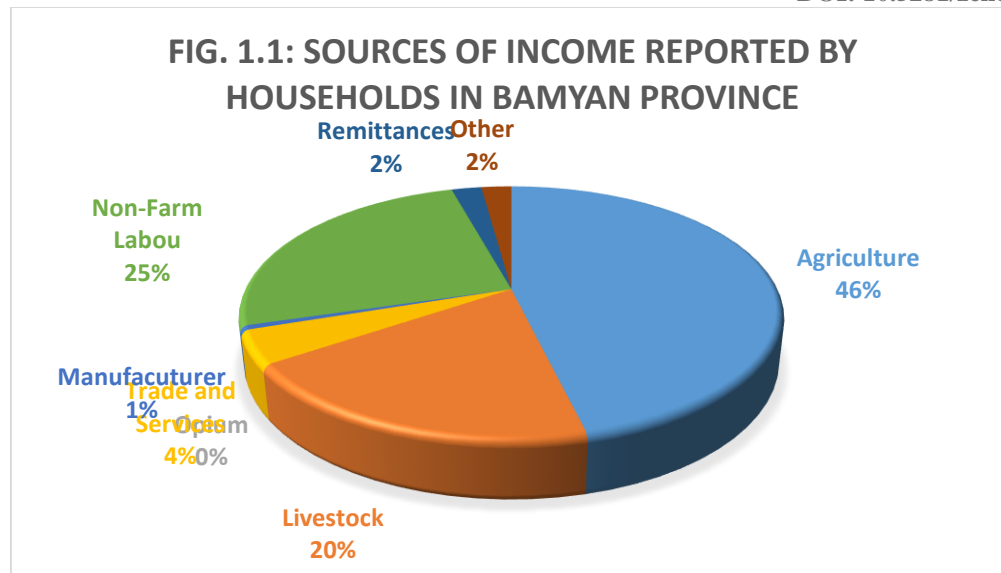
In Afghanistan about three fifth of the population is living under \$2 dollars a day. Due to this prevailing poverty, major portion of the population is incapable to purchase and consume quality nutritious food items. Children are normally underweight and of poor health, causing labour force to low productivity. Afghanistan's economy is agro-based, where over 60 percent of labour force is involved with agriculture and almost 80 percent of population directly or indirectly dependents upon agriculture. Despite its importance in the economy, agricultural production is far behind than its potential level. Small land holdings, minimal or suboptimal use of inputs, due to inadequate purchasing capability of the farmers' are the reasons responsible for low productivity. By consideration of these factors, farmers are forced to grow short duration crops to fetch nominal returns.

Among short duration crops, potato farming is considered one of the most feasible ventures. Potato is the fourth important crop in world after rice, wheat and maize (FAO 1995). In Afghanistan, potato has emerged as a high yielding crop and the area under potato has increased in past years. While Bamyan province is the leading potato producer that 340 thousand tons in 2015. Potato consumption in the country is seasonal and high during the harvest season.

Table 1.1: Sources of income reported by households in Bamyan province

Sources of income	Rural (%)	Urban (%)	Total (%)
Agriculture	86		86
Livestock	36		36
Opium	0		0
Trade and Services	8		8
Manufacturer	1		1
Non-Farm Labour	47		47
Remittances	4		4
Other	4		4

Based on NRVM survey in 2005, 86 percent of income source of household in Bamyan province in agriculture. And 36 percent of household income is based on livestock products, similarly, 47 of income of household income related to non-farm labour. As shown in Table 1.1 and Fig. 1.1.



1.1. Introduction

Potato is a major food crop, grown in more than 100 countries in the world. According to FAO (2008), potato is consumed by more than one billion people in the world. It is a high quality vegetable cum food crop and used in preparing more than 100 types of recipes. The protein content of potato has a high biological value than cereals and considered to be better than milk. Hence, potato is supplementing meat and milk products by lowering energy intake and also by reducing food cost.

Potato (*Solanum tuberosum* L.) popularly known as ‘The king of vegetables,’ has emerged as 3rd most important food crop in Afghanistan after wheat and rice. Afghanistan vegetable basket is incomplete without potato. Potato is a nutritionally superior vegetable due to its edible energy and edible protein. It has become an integral part of breakfast, lunch and dinner among the larger population. Being a short duration crop, it produces more quantity of dry matter, edible energy and edible protein in lesser duration of time compared to cereals like rice and wheat. Hence, potato is considered to be an important crop to achieve nutritional security of the nation.

1.2. Origin of Potato

South America is known to be the native of potato. In 1537, the Spaniards first came in to contact with potato in one of the villages of Andes. In Europe, potato was introduced between 1580 A.D. to 1585 A.D. in Spain, Portugal, Italy, France, Belgium and Germany. In Afghanistan, it was introduced in 1952 and rarely produced in Bamyan, then it was introduced in Baghlan, Maidan Wardak, Ghazni, Logar and other provinces of Afghanistan.

Potato Production in the World

Potato is grown in more than 100 countries in the world. China ranks first, followed by Russia, Afghanistan, USA, Ukraine, Germany and Poland put together constitute more than 62.00 per cent of total global production.

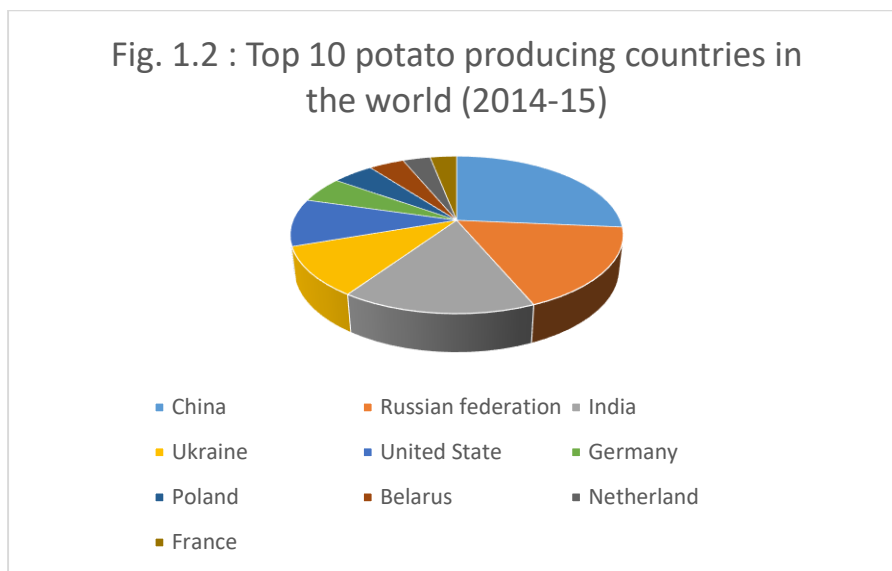
Country-wise production of potato in the world from 2009 to 2010 presented by Table 1.2 and graphically depicted in Fig. 1.2. It can see the top seven countries in the world are china, Russia, Afghanistan, Ukraine, USA, Germany and Poland.

Potato production in Afghanistan

Table 1.2: Top 10 potato producing countries in the world (2014-15)

Rank	Country	Production (Lakh Metric tonnes)	Percentage
1	China	570.60	26.39
2	Russian federation	372.70	17.23
3	India	344.00	15.91
4	Ukraine	220.62	10.20
5	United State	210.97	9.75
6	Germany	116.24	5.37
7	Poland	103.69	4.79
8	Belarus	88.50	4.09
9	Netherland	67.77	3.19
10	France	66.80	3.08
	Total:	2161.89	100.00

Fig. 1.2 : Top 10 potato producing countries in the world (2014-15)



[Source: Food and Agricultural Organization (FAO)].

In Afghanistan, potato is cultivated in almost all provinces under diverse agro-climate conditions. About 65.00 per cent of potatoes are cultivated in Kabul, Maidan Wardak, Nangarhar, Laghman, Badakhshan, Heart, Bamyān, Baghlan, Panjsher and Helmand,

Bamyān province of Central Afghanistan. Other province of Afghanistan accounted for more than 35.00 per cent share in total production. The production of potato in all provinces of Afghanistan is furnished in Table 1.3.

Table 1.3: Province-wise production of potato in Afghanistan (2015-16)

Sr. No.	Province	Production (t)	Percentage
1.	Kabul	37975	7.65
2.	Wardak	48160	9.70
3.	Nangarhar	20140	4.06
4.	Laghman	19000	3.83
5.	Badakhshan	21850	4.40
6.	Herat	14300	2.88
7.	Bamyan	234800	47.29
8.	Baghlan	11550	2.33
9.	Panjsher	1900	0.38
10.	Helmand	5000	1.01
11.	Others	119782	24.13
Total:		496482	100

Source: Ministry of Agriculture, Irrigation and Livestock (MAIL), 2016.

1.3. Potato production in Bamyan

Bamyan is one of the important potato growing province in Afghanistan. Potato is one of the important crops in four districts of the province. Potato is predominantly grown in Yakowlang, Bamyan center, Shibar and Saighan districts.

Table 1. 4: Estimated potato production in Bamyan province in 2014-15

Location	Production(000'MT)	Percent (Total production in Bamyan)
Bamyan center	100	50
Yakowlang	40	20
Shebar	35	17.5
Kahmarad	25	12.5

Source: Bamyan, DAIL

It can be seen from the table, area under potato was highest for years of 2010-11 and 2011-12 which was about 20500 ha and production was highest for the years 2013-14 which was about 302980.2 tonnes as well as the productivity was highest (i.e., 13.6 tonnes per ha) for the year 2014-2015.

Share of different province in total area and production of potato for the years of 2014-15 is showed in Table. 1.4, Potato is grown in all province of Afghanistan.

The area, production and productivity of potato in Bamyan Province are presented in Table 1.5.

Table 1.5: Area, production and productivity of potato in Bamyan, from 2008-9 to 2014-15

Year	Area	Production	Yield
	Ha	ton	(t/ha)
2008-9	20000	280000	14.0

2009-10	21600	302400	14.0
2010-11	20500	246000	12.0
2011-12	20500	205000	10.0
2012-13	21000	230013	11.0
2013-14	22960	302980.2	13.2
2014-15	25009	340257	13.6
Average		238331.3	11.0

Source: Ministry of Agriculture, Irrigation and Livestock (MAIL)

It can be seen from the table area under potato cultivation in Bamyan was highest (i.e., 25009 ha) for the years 2014-15 whereas, the production was the highest for the year of 2014-15 which was 340257 tonnes and the productivity was also highest for the year of 2014-15 which was about 13.6 tonne per hectare.

The average consumption of potato in many countries of the world viz., Netherlands, Russia, China, Belgium, France and Canada varies from 50 to 175 kg of tubers per capita per annum, both as fresh and processed, whereas in Afghanistan, it is less than 15 kg. Our diet consists of nearly 2.5 per cent of potato. In several industrially advanced countries of Europe and America, 50-60 per cent of the daily diets are derived from potato (<http://www.faostat.fao.org>). In Afghanistan, an average person eats nearly 40 g of raw potatoes per day which provide about 45 calories or only about one fiftieth equivalent (1/50th) of the daily energy requirement (2200 cal. per day) (<http://www.faostat.fao.org>.)

Potato is a global crop and is a nourishing food that has sustained civilizations for centuries in South America and Europe. Potato has been the most useful during war time experiences of American and European countries bearing testimony to the great value of potatoes as food. Today, the nations of the world are much concerned about their food security, which is closely related to health and malnutrition. Potato is a winter crop with very high yield potentiality as compared to other food crops. It is an efficient food producer and has the potential to become a supplementary staple food besides cereals in the country. It has been recognized as a wholesome food and the richest source of energy in most of the countries where, it forms an important part of the human diet.

Table 1.6: Major constituents of potato tuber

Sr. No.	Constituents	Content (%)
1.	Water	70-80
2.	Carbohydrates (Starch and sugars)	16-18
3.	Crude proteins	2.5-3.2
4.	Fiber	0.6
5.	Fat	0.1
6.	Minerals	1.0

(<http://wwwfaostat.fao.org>.)

The nutritional qualities of potato often go unrecognized by as many people have myths about potato being only a source of starch contributing to weight and obesity. But potato almost completely lacks fats or has it in a very low amount (0.1 to 0.2 per cent), a substance with twice

the calorie value of carbohydrates. Potato can thus be consumed in much larger quantities without running the risk of becoming fat (Chadha, 1994). Potato is one of the most important and popular vegetables available through the year in all parts of Afghanistan. Potato is an ideal crop that is highly efficient in converting sunlight into nutritious food.

1.4. Objectives

- 1) Understanding the production and marketing level of potato and to calculate the cost of cultivation of potato in Bamyan province
- 2) Identifying the changes of production and productivity of potato in Bamyan province
- 3) Identifying the most productive varieties of both potato growing in Bamyan
- 4) Studying potato value and to identify the main constraints faced by the farmers in potato production and marketing

2. Literature Review

The efficient marketing of potato is crucial to the development of the Afghanistan potato sector and for the provision of an important food source to the urban areas. The range of contentious issues is wide and includes price instability, middlemen's margins, demand trends, postharvest handling, processing and export potential. This study presents for the first time an overview of the potato marketing system and examines the problems that arise. Comprehensive data are provided on price behavior, consumer demand, storage] the functioning of the system, including the seed potato market. Constructive comment is given to assist in overcoming difficulties experienced.

Water permitting, potatoes are an ideal vegetable crop for Afghanistan and the provinces circling Kabul have traditionally been large producers. Potatoes are usually brought by farmers into collection markets from where traders buy and ship them in Hessian sacks to the major regional wholesale markets. Kabul acts as the main transshipment point for other regions of the country. Last year no potatoes were shown as being exported. If accurate, this must be a function of the drought conditions. Traditionally, Afghanistan has been a major supplier of potatoes into the neighboring countries and could be so again. Storage of potatoes is a major constraint to developing this market. There is scope to grow seed potatoes in the remoter areas of the country and provide certified disease free planting material to the rest of the country and to Pakistan. Without adequate storage, this can never be realized.

Potatoes are the most important cash crop produced in the Bamyan province. (AREU, 2007). They surmised some of these problems:

- Pressures to sell at low prices directly after harvest
- Ineffective traditional storage methods
- No direct access to the market
- High costs due to poor road conditions and inadequate road infrastructure
- Lack of a market for processed potato products

According to FAO (2003), Afghan farmers are showing an increased interest in cash crop production from which they have a comparative economic advantage over the production of traditional subsistence crops.

An important additional consideration that impacts the viability of horticulture is the role that poppy cultivation has played in Afghan crop production. There is currently strong international and regional pressure to reduce poppy production in Afghanistan. Among short duration crops, potato farming is considered one of the most feasible ventures. Potato is the fourth important crop in world after rice, wheat and maize (FAO 2012).

Potato is the second staple food after wheat in Afghanistan. International Centre for Agricultural Research in the Dry Areas (ICARDA) and International Potato Centre (CIP) introduced high yielding potato variety Kufri Chandramukhi (KCM) and its production technology to develop an efficient seed production system that helped in reducing poverty and increasing food production in Bahrak district of Badakhshan province of Afghanistan (T. Srinivas and others, 2012). It is grown in an area of 21,900 ha producing 333,600 t at an average productivity of 15.23 t/ha (FAOSTAT, 2012). It is grown in provinces like Bamyan, Ghazni, Helmand, Kunduz,

Badakhshan, Wardak, Parwan, etc.

3. Material and Methods

The chapter deals with the description of the study area, the sampling techniques adopted, the method of survey, the nature and sources of data and the various tools and techniques employed in analyzing the data.

The methodology adopted presented under the following major heads:

3.1. Area of Study

The study area was Bamyan center and Yakowlang district of Bamyan. The reasons for selecting Bamyan are as under:

- 1) Potato is important vegetable as well as cash crop for Yakowlang and Bamyan district of Bamyan province.
- 2) The Yakowlang district ranks second in term of area under potato cultivation in Bamyan after Bamyan center district.
- 3) It's the most profitable crop for this area.

3.2. Sampling Technique

In orders to achieve the objectives of the study, the purposive sampling technique was adopted.

Selection of District

Potato cultivation in Bamyan is largely concentrated to Bamyan center and Yakowlang district that was the reason that these districts were selected purposively based on its accessibility and relevance of the study.

Selection of Villages

From the two selected districts Yakowlang and Bamyan three villages from each selected district were selected randomly. Total of six villages were selected for the study.

Selection of Farmers

From selected six villages, 21 farmers were selected from each village. For that, a list of farmers from the selected village was prepared and seven farmers were selected purposively category-wise into small (below to 2.0 ha) medium (2.1 to 4 ha) and large (more than 4.0 ha) farmers.

The final sample that emerged thus comprised covered 126 farmers spread over the selected area. The details of selected farmers are given in Table 3.1.

Table 3.1: Distribution of selected farmers in Yakowlang and Bamyan districts of Bamyan province

District	Selected village	Number of selected farmers			
		Small	Medium	Large	Total
Yakowlang	Sarbulque	7	7	7	21
	Shatughan	7	7	7	21
	Koshkak	7	7	7	21
Bamyan	Taibuti	7	7	7	21
	Sar Asiab	7	7	7	21
	Tolwara	7	7	7	21
Total:		42	42	42	126

3.3. Data Collection

Both primary data and secondary data were collected for the study. From the selected farmers, the primary data were collected on the area covered by potato, cost incurred in inputs, cost of cultivation, prices received, the quantity sold, the output, net profit earned and cold storage information etc. This information was collected through personal interviews with the farmers with the help of pre-tested schedule for the year 2016-17. Similarly, relevant information on market, arrivals, and prices paid and cost incurred in cold storage etc., was obtained through the records of selected market functionaries such as wholesaler, retailers, institutes, NGOs etc. This information was also canvassed through personal interviews of the selected processors with the help of pre-tested schedules for the year 2016-2017.

Secondary data was obtained from published reports and official records of the Directorate of Agriculture, Irrigation and Livestock (MAIL), FAOSTAT, Central Statistics Office (CSO) Afghanistan, Agricultural Support Program in Bamyan,

3.4. Analytical Procedure

The various statistical tools such as average, tabular analysis indices, SWOT etc. were adopted for analytical procedure.

3.4.1. Economics of Potato Cultivation

The data were collected regarding the cost of cultivation of potato for the year 2015-16 from selected samples of farmers. The techniques used in calculating cost of cultivation were simple average, tabular analysis and weighted average adopted for identifying and comparing output, price and net profit of selected farmers, according to the size of farms and for the whole districts.

The cost concept that has been used in farm management studies such as Cost-A, Cost-B, Cost-C₁ and Cost-C₂ covered in the analysis. The input items included for various cost concepts are as under:

- Cost-A : Hired human labour, bullock labour, manures, chemical fertilizers, seeds, land revenue, insecticides and pesticides, miscellaneous cost and interest on working capital
- Cost-B : Cost-A + Rental value of own land + Interest on own fixed capital
- Cost-C₁ : Cost-B + Value of family labourers
- Cost-C₂ : Cost-C₁ + 10 % of Cost-C₁

In the study area, farmers do not cultivate as tenant farmers.

3.5. Limitations of the Study

The study is related to economics of production, marketing and value chain of potato in Yakowlang and Bamyang districts. In view of the time and resources constraints, all the possible efforts were made to make the study more perspective and precise.

The following were the limitations of the present study:

- 1) The area of the study was limited to only Bamyang and Yakowlang districts of Bamyang province.
- 2) As per the area under cultivation of potato crop, six villages from Bamyang and Yakowlang district were selected.
- 3) The primary data were collected only for potato cultivation 2016-17 by survey method.

4. Results and Discussion

The chapter deals with the finding of the present investigation that has been made after subjecting the data to the necessary tabulation and analysis, keeping the objective in mind. The finding of present study is discussed in the following four objectives mentioned earlier:

4.1. Understanding the production and marketing level of potato and to calculate the cost of cultivation of potato in Bamyang province

Production level of potato increased over the years from 280,000 tonnes in 2008-9 to 340,257 tonnes in 2014-15 in Bamyang province. Also the area of potato cultivation in Bamyang increased from 2000 Ha in 2008-9 to 25009 Ha in 2014-15. But comparing productivity as average decreased

from 14 tonnes per hectare to 13.6 tonnes per hectare in 2008-9 and 2014-15 respectively. As presented in table below.

Table 4.1: Area, production and productivity of potato in Bamyar, from 2008-9 to 2014-15

Year	Area	Production	Yield
	Ha	ton	(t/ha)
2008-9	20000	280000	14.0
2009-10	21600	302400	14.0
2010-11	20500	246000	12.0
2011-12	20500	205000	10.0
2012-13	21000	230013	11.0
2013-14	22960	302980.2	13.2
2014-15	25009	340257	13.6
Average		238331.3	11.0

The data regarding the cost of cultivation for different categories of potato growers was collected and analyzed for the agriculture year 2016- 2017. The result on this aspect is discussed and presented in this part of chapter.

The cost of cultivation studies in an area not only furnishes information on the relative profitability of the enterprises, but also serves as a guide for better choice and combination of farm input for maximizing returns. The cost of cultivation of potato mainly depends on the major input used, techniques of cultivation, yield and prices for major inputs. Profit depends on sale price and yield obtained. Generally, farmers do not take into account their fixed capital, depreciation cost of own fixed implements and machinery etc., used on the farms. They generally count Cost-A, only which includes operation cost only. But in the scientific study like this, the Cost-A, Cost-B, Cost-C₁ and Cost -C₂ were estimated.

Average Size of Farms and Family Size of Selected Farmers

Average size of farms and family size of selected farmers in Yakowlang district is presented in Table 4.2

Table 4.2: Average size of farms and family size of selected farmers in Yakowlang and Bamyar district (N = 126)

Category	Average number of family members	Operational size of farms (ha.)	Average area under potato crop (ha.)	Per head area under potato crop (ha.)	Per cent area to total area under potato crop
Small	6.37	1.05	0.04	0.0062	38.05
Medium	5.42	2.99	1.55	0.28	51.28
Large	6.95	6.46	3.50	0.51	58.85
Average	6.25	3.5	2.03	0.32	45.40

The table indicates that the small, medium and large farmers have an average 6.37, 5.42 and 6.95 family members, respectively. The average size of land holding of potato growers were estimated about 3.5 hectare. The small, medium and large farmers were having 1.05, 2.99 and 6.46 hectares of operational size of farms, respectively. On an average 45.40 per cent of the cultivated land with

farmers was under potato crop. The average area under potato cultivation increases with the increase in the size of farms. The average area under potato cultivation per farmer was estimated to be about 2.03 hectares. Per head, area under potato cultivation ranged from 0.0062 to 0.51 hectares with an average of 0.32 hectare.

4.2. Productivity of 13 potato varieties cultivated by FAO in Bamyan

As a research was conducted by FAO from 2007 to 2009 in Bamyan to compare the productivity of 13 different varieties of potato in Bamyan (Mullah Ghulam Research Farm). Indicated that among all 13 varieties of potato Marabel 1 gave higher yield that was 67.47 tonnes per ha. Followed by Loura wich yielded 65.37 tonnes per ha. Similarly, the lowest yield recorded was K Bad-Sha that was 32.37 tonnes per ha. Detail are presented in Table 4.3.

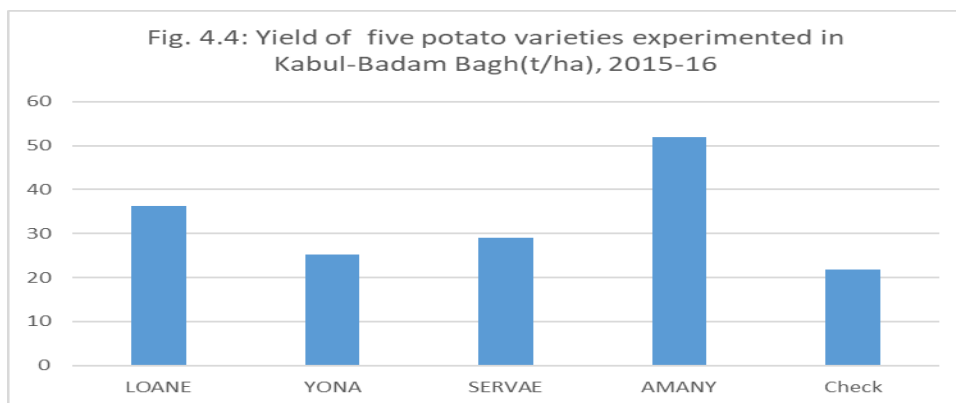
Table 4.3: Productivity of 13 potato varieties cultivated by FAO in Bamyan(Mullah Ghulam) Research farm in 2007-2009.

Productivity T/Ha	2009 Yield MT/ha	2008 Yield MT/ha	2007 Yield Mt per/ha	Maturity days	Variety	Plot No
58.67	63	58	55	130	Agria	1
67.47	71	71.4	60	130	Marabel 1	2
61.63	74	62.9	48	130	Marabel 2	3
62.93	59	66.8	63	130	Milva	4
65.37	75	55.1	66	130	Loura	5
51.13	55	56.4	42	130	Desiree	6
49.82	48	45.45	56	130	Kufri Bahar	7
52.17	56	52.5	48	130	KCM	8
48.6	48	53.8	44	140	KPukhraj	9
32.37	31	33.1	33	150	K Bad-Sha	10
52.17	55	43.5	58	145	Samadi	11
56.2	60	50.6	58	150	Sabzgul	12
49.87	36	50.6	63	150	Safidgul	13
57.33	56.9	55.1	60	150	Begul	14

Productivity of four French potato variety in Bamyan, Kabul and Panjsher provinces in 2015-16 Beside of local and improved potato varieties cultivated in Afghanistan. French Cooperation Office for Ministry of Agriculture, Irrigation and Livestock also imported four French potato varieties from France in 2014 named as, Loane, Yona, Servae and Amany that were trailed in three provinces of Afghanistan by this office. As a comparison between these four varieties in three provinces with a local variety called Begul from Bamyan provinces in all three varieties. Following are the field results collected by its researcher.

Table 4.4: Yield of five potato varieties experimented in Kabul-Badam Bagh(t/ha), 2015-16

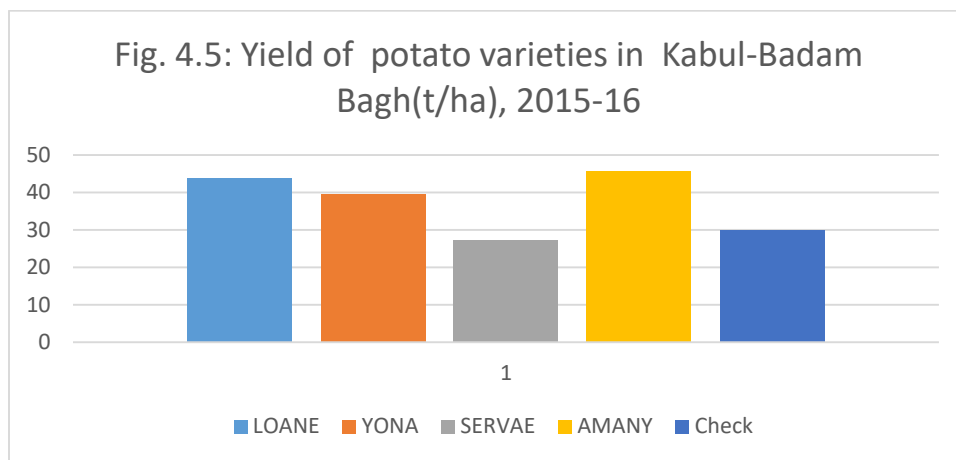
Variety	Rep-1	Rep-2	Rep-3	Average	Rank
LOANE	31.43	45.71	31.43	36.19	2
YONA	31.43	22.86	21.43	25.24	4
SERVAE	34.29	28.57	24.29	29.05	3
AMANY	51.43	65.71	38.57	51.90	1
Check	17.14	35.71	12.86	21.90	5



As the result presented in Table 4.4 and Fig 4.4. among check, and other three varieties, Amany variety gave higher yield in Kabul, Badam Bagh research farm that was almost 52 t/h, which Loane is 36.19 t/ha, Yana is 25.24 t/ha, and Servae is 29.05 t/ha.

Table 4.5: Yield of potato varieties in Kabul-Badam Bagh(t/ha), 2015-16

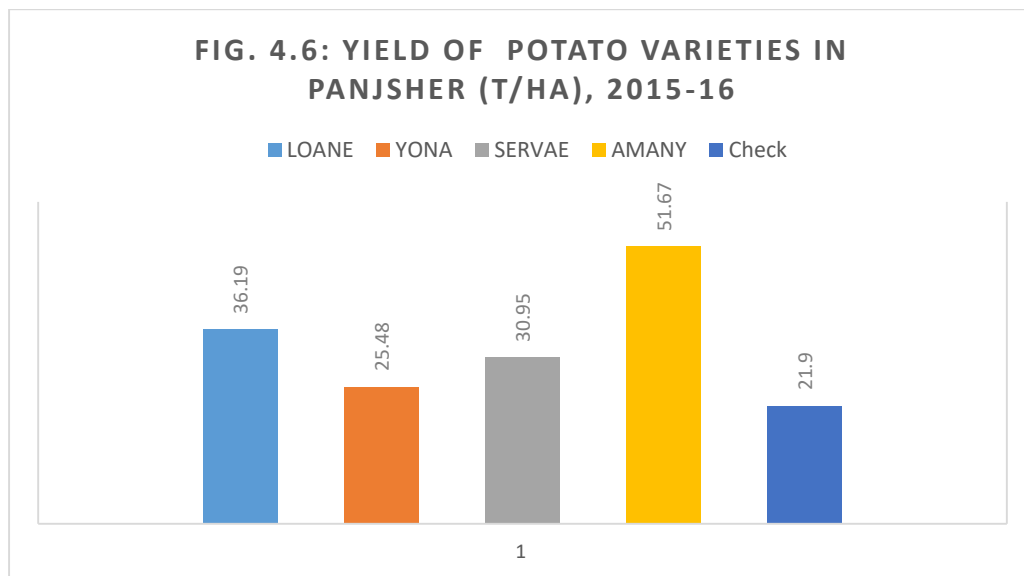
Variety	Rep-1	Rep-2	Rep-3	Average	Rank
LOANE	47.14	40.00	44.29	43.81	2
YONA	44.29	38.57	35.71	39.52	3
SERVAE	22.86	38.57	20.00	27.14	5
AMANY	50.00	40.00	47.14	45.71	1
Check	21.43	37.14	31.43	30.00	4



As the result presented in Table 4.5 and Fig 4.5. among check, and other three varieties, Amanya variety gave higher yield in Bamyan, Mullah Ghulam research center that was almost 45.71 t/h, which Loane is 43.81 t/ha, Yana is 39.52 t/ha, and Servae is 27.14 t/ha.

Table 4.6: Yield of potato varieties in Panjsher (t/ha), 2015-16

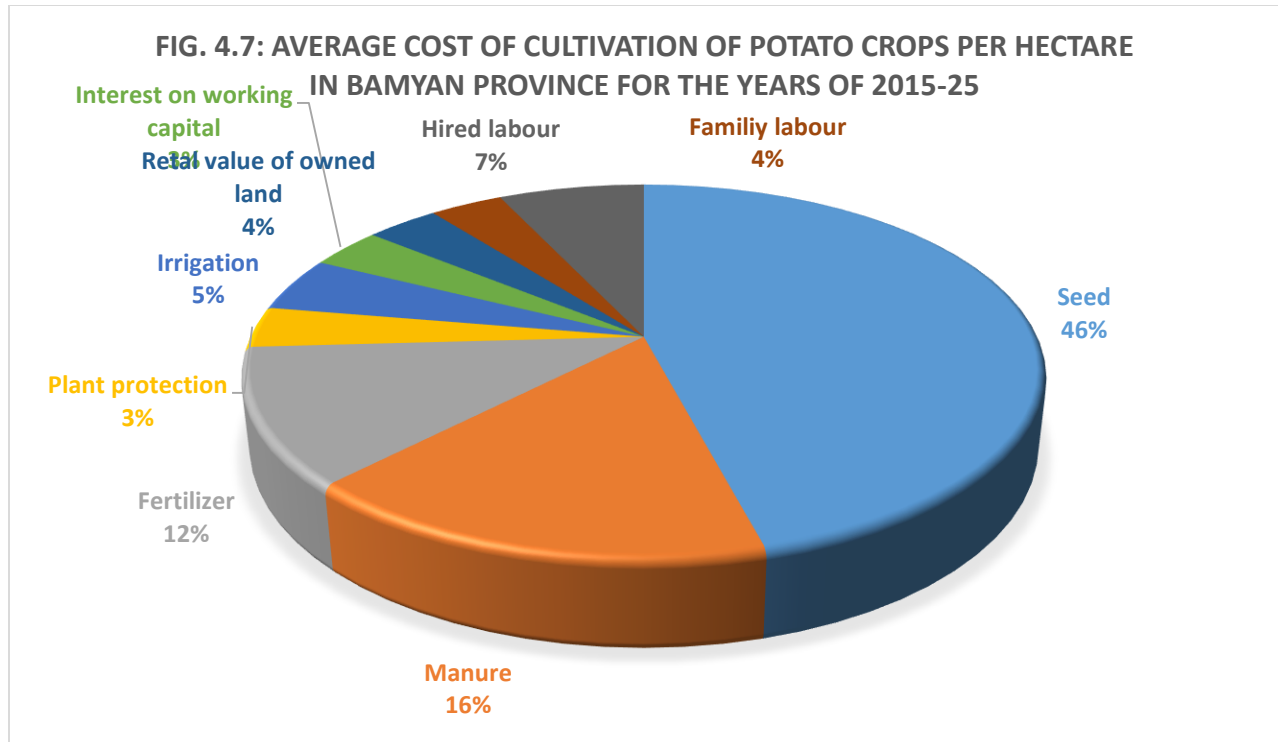
Variety	Rep-1	Rep-2	Rep-3	Average	Rank
LOANE	31.43	45.71	31.43	36.19	2
YONA	31.43	23.57	21.43	25.48	4
SERVAE	35.71	35.71	21.43	30.95	3
AMANY	50.00	66.43	38.57	51.67	1
Check	17.14	35.71	12.86	21.90	5



As the result presented in Table 4.6 and Fig 4.6. Among check, and other three varieties, Amanya variety gave higher yield in Panjsher, Khinj district that was 51.67 t/h, which Loane is 36.19 t/h, Yana is 25.48 t/ha, and Servae is 30.95 t/ha.

Cost of Cultivation

It is well known that potato being labor intensive crop requires relatively higher investment than other field crops. Factor-wise distribution of total cost and per hectare is graphically depicted in Fig 4.7.



The table 4.7 reveals that on an average, total cost per hectare for potato crop was AFN.121007.86. On reviewing, the size-wise total cost per hectare, it can be seen that it was the highest (AFN.138901.42) for large farmer followed by medium farmers (AFN.120023.56) and small farmers (AFN.104098.61).

On average, among the total cost per hectare, it was observed that seed covered 39.09 per cent (AFN.47304.10) of the total cost. The share of seed cost in all the farmers categories was higher due to higher price of potato seed, whereas manure accounted for 13.48 per cent (AFN.16318.71) of the total cost, fertilizer 10.04 per cent (AFN.12156.80) of total cost, hired labour 5.70 per cent (AFN.6903.06) followed by cost of irrigation (4.41 per cent), machinery (4.27 per cent) and plant protection charge (2.63 per cent).

Among different categories of farmers, it was observed that seeds ranked the prime place in the range of AFN.39178.5 for small farmers, AFN.47550 for medium farmers and AFN.55183.8 for large farmers. Manure cost was highest (AFN.20658.82) for large farmers and the lowest (AFN.12478.57) for small farmers and also fertilizer cost was the highest in large farmers (AFN.12232.52) and the lowest (AFN.12077.54) for medium farmers. Hired labour cost was highest in large farmers (AFN.8214.11) and the lowest (AFN.5785.71) for small farmers. Irrigation cost was the highest in medium farmers (AFN.5831.25) and the lowest (AFN.4657.14) for small farmers. Machinery was the highest in large farmers (AFN.5501.47) and the lowest (AFN.4500) for small farmers. Plant protection charge was highest in small farmers (AFN.3611.42) and the lowest (AFN.2896.87) for medium farmers while miscellaneous charge was high (2.27 per cent) for medium farmers and lowest (1.54 per cent) for small farmers. The rental value of owned land varies in the range of AFN.4193.75 for medium farmers to AFN.4021.42 for small farmers.

Estimate of Different Cost

Estimate of different cost such as Cost-A, Cost-B, Cost-C₁ and Cost-C₂ are presented in Table 4.3.

Table 4.7: Estimates of different costs per hectare (N = 126)

Categories of farmers	COST			
	A	B	C ₁	C ₂
Small	87633.98 (84.18)	92021.84 (88.39)	94635.10 (90.90)	104098.61 (100.00)
Medium	101639.01 (84.68)	106190.10 (88.47)	109112.32 (90.90)	120023.56 (100.00)
Large	118076.07 (85.00)	122624.16 (88.28)	126274.02 (90.90)	138901.42 (100.00)
Average	102449.68 (84.66)	106945.36 (88.37)	110007.14 (90.90)	121007.86 (100.00)

Figures in parenthesis indicate percentage to Cost-C₂.

It can be observed from the above table that the average Cost-A, accounted for 84.66 per cent (AFN.102449.68) while, Cost-B 88.37 per cent (AFN.106945.36) of the total cost for selected farmers. The share of Cost-A was lowest (84.18 per cent) for small and medium farmers while, 85.00 per cent for large farmers. Further, on an average, Cost-C₂ was AFN.121007.86 per hectare which increased with the increase in the size of farms. It ranged from AFN.104098.61 for small farmers to AFN.138901.42 for large farmers.

Yield, Gross Income and Net Gains

Details regarding yield, gross income and net gain realized per hectare over different costs are presented in Table 4.9.

Table 4.8: Yield level, gross income and net gain per hectare over different costs One bag normally weight 100 kg (14 seer) (N = 126)

Categories of farmers	Yield (Bag)	Gross income (AFN.)	Net gains over			
			Cost-A	Cost-B	Cost- C ₁	Cost- C ₂
Small	281.34	251462.80	163828.82	159440.96	156827.70	147364.19
Medium	284.73	259855.19	158216.18	153665.09	150742.87	131831.63
Large	288.68	262435.69	144359.62	139811.53	136161.67	123534.27
Average	284.92	257917.89	155468.20	150972.52	147910.74	134243.36

The table 4.8 shows that, on average, yield of potato for selected farmers was 284.92 bag per hectare. Among the different group of farmers, it was the highest (288.68 bags) for large farmers and the lowest (281.34 bags) for small farmers. This may be due to timely supply of input and better managerial capacity of farmers than small and medium farmers.

Average gross income realized from one hectare of potato was AFN.257917.89 for selected farmers. Among the different categories of farmers, it was the lowest (AFN.251462.80) for small farmers and highest (AFN.262435.69) for large farmers followed by medium farmers (AFN.259855.19).

On studying the data regarding net income over different cost per hectare viz., Cost-A, Cost-B, Cost-C₁ and Cost-C₂, it was found that average net gains over operational cost (i.e., Cost-A) was AFN.155468.20 per hectare. Net gain over Cost-A was highest (AFN.163828.82) for small farmers followed by medium farmers (AFN.158216.18) and large farmers (AFN.144359.62).

Further, net gain over Cost-C₂ was AFN.134243.36 for average farmers. It was AFN.147364.19, AFN.131831.63 and AFN.123534.27 per hectare for small, medium and large farmers, respectively.

Marketable Surplus of Potato

Farmers have to give up a considerable quantity of their produce in a different way viz., home consumption, seed requirement, deterioration, given to relative etc. After deducting all these internal consumptions from total production, the remaining quantity of production is available for the farmers to sell. The average internal consumption, average production and average marketable surplus of potato by selected farmers are presented in Table 4.9.

Table 4.9: Production and marketable surplus of potato for selected farmers in Yakowlang district during 2014 (N = 126)

Category	Average production of potato	Average internal consumption					Average marketable surplus
		Home consumption	Seed requirement	Deterioration	Given to relative	Total	
Small farmers	281.35	1.71 (0.61)	20.66 (7.34)	9.56 (3.40)	0.60 (0.21)	32.53 (11.56)	248.81 (88.44)
Medium farmers	284.73	2.42 (0.85)	4.91 (1.72)	11.95 (4.20)	1.55 (0.55)	20.83 (7.31)	263.91 (92.68)
Large farmers	288.68	3.62 (1.25)	11.56 (4.00)	13.50 (4.67)	2.33 (0.81)	31.00 (10.74)	257.68 (89.26)
Average farmers	284.92	2.52 (0.88)	12.37 (4.34)	11.67 (4.09)	1.50 (0.52)	28.12 (9.86)	256.8 (90.13)

Figures in parentheses are percentage to the average production of potato.

The table shows that, the average marketable surplus of potato for selected farmers was 90.13 per cent (256.8 bags). The remaining quantities accounted for internal consumption in which seed requirement accounted 4.34 per cent, followed by deterioration with 4.09 per cent while home consumption and given to relative was 0.88 and 0.52 per cent, respectively. Among different categories of farmers, average marketable surplus ranged from 248.81 bag for small farmers to 263.91 bag for medium farmers. In percentage terms, it recorded 88.44 per cent and 92.68 per cent of average potato production, respectively.

Among the selected farmers, the seed requirement was higher in case of small farmers (20.66 bag) than large farmers (11.56 bag) and medium farmers (4.91 bag). The reason may be use of seed potato were higher by the small and large farmers. It was noticed that, the percentage share of produce kept decreased with increase of the size of farm, reason is may be large size farmers used new and high productivity variety, further it was observed from the table that, deterioration, given to relative and home consumption increased with increased size of farms.

Place-Wise Sale Within and Out of District

Place-wise sale within and out of Yakowlang district is given in Table 4.10. The producers disposed off their produce out of district mainly to Ahmedabad market, it was observed that about 79.94 per cent was sold within the district, but 20.05 per cent off produce was disposed off out of the district by selected farmers.

Table 4.10: Place-wise sale within and out of district of Yakowlang (N = 126)

Place of sale	Small farmers		Medium farmers		Large farmers		Average farmers	
	Qty. of sale in one bag	Per cent of total one bag	Qty. of sale in bag	Per cent of total Qty. sale	Qty. of sale in bag	Per cent of total Qty. sale	Qty. of sale in bag	Percent of total Qty. sale
Within district	211.49	85	211.13	80	193.26	75	205.30	79.94
Out of district	37.32	15	52.78	20	64.42	25	51.50	20.05
Total:	248.81	100	263.91	100	257.68	100	256.80	100

The quantity of potato sold within district in percentage term was higher for small farmers (85.00 per cent) followed by medium farmers (80.00 per cent) and large farmers (75.00 per cent) whereas the quantity of potato sold out of district in percentage terms was higher for large farmers (25.00 per cent) followed by medium farmers (20.00 per cent) and small farmers (15.00 per cent)

Constraints Faced by The Farmers in Production and Marketing of Potato

The perusal of the data presented in Table 4.12 reveals that “price instability of potato” was the main problem faced by 53.17 per cent of potato growers and this was ranked first. This was followed by high storage charge 50.79 per cent, which ranked second. The constraint viz., uncertainty of weather (39.68 per cent) obtained third rank. While inadequate marketing facilities (36.50 per cent) and spoilage of potato (34.12 per cent) was placed in fourth and fifth ranks respectively. Unavailability of labour (33.33 per cent), lack of credit for storage facility (31.74 per cent) and non-remunerative price for potato received sixth, seventh and eighth ranks, respectively. This result indicates that the major problem faced by the potato growers were price instability of potato, high storage charges, uncertainty of weather, inadequate marketing facilities and spoilage of potato.

Table 4.11: Problems faced by farmers in potato marketing (N = 126)

Sr. No.	Problems	Frequency	Percentage	Rank
1.	Price instability of potato	67	53.17	I
2.	Spoilage of potato	43	34.12	V
3.	Unavailability of labour	42	33.33	VI
4.	Uncertainty of weather	50	39.68	III
5.	Non-remunerative price for potato	24	19.04	VIII
6.	Inadequate marketing facilities	46	36.50	IV
7.	High storage charge	64	50.79	II
8.	lack of credit for storage facilities	40	31.74	VII

The important problem faced by the farmers was price instability of potato, because potato is a risky crop and it's production is uncertain, if season is favorable farmers get bumper production. In case of several disease attacks, production goes down and hence the prices are fluctuating every year, secondly potato is a perishable crop.

The second problem faced by the farmers was high storage charge, this may be due to the fact that construction of cold storage requires high cost, for which owner has to take the loan. On the other hand, the electric charges are also high. As result they are charging high rent from the farmers in order to maintain their profit.

5. Summary and Conclusions

The present study on “**An economic analysis of production, marketing and value chain of potato in Bamyan province**” was undertaken for studying the trend in production, productivity, marketing, value chain, cost of cultivation and problems faced by the farmers in production and marketing of potato. In Bamuan, potato is an important cash crop. Potato is emerged as an important vegetable crop for Yakowlang district of Bamyan province, with better productivity. Therefore, a study of economics of cultivation, marketing, value chain in Yakowlang district was undertaken.

For this study, Yakowlang district was selected. 126 farmers were selected from the six villages, three for each district (Bamyan and Yakowlang). Relevant information was collected from the potato producer to know the economics of potato cultivation and analysed according to various cost concept used in farm management studies. Cost of cultivation of potato was calculated from the primary data collected from purposively selected grower of potato.

Cost of Cultivation of Potato

- 1) The average area under potato crop for small, medium, large farmers was 4.03 hectare and it increased with increase in size of farms.
- 2) The per head area under potato crop was highest for large farmers 1.23 hectare followed by medium farmers (0.48 ha) and small farmers (0.17 ha).
- 3) Per hectare average total cost (Cost-C₂) of potato was AFN.121007.86. It was highest for large farmers (AFN.138901.42) followed by medium farmers (AFN.120023.56) and small farmers (AFN.104098.61). Further, the break-up of total cost for selected farmers indicated

that seed covering highest share of 39.09 per cent, followed by manures (13.49 per cent), fertilizer (10.04 per cent), human labour (5.70 per cent), irrigation (4.41 per cent) machinery (4.27 per cent) and rental value of owned land (3.41 per cent).

- 4) Cost-A shared about 84.66 per cent of the total average cost for selected potato growers. It varies from 84.18 per cent for small farmers to about 85.00 per cent for medium and large farmers.

On an average, the total cost of cultivation per hectare on the basis of Cost-C₂ was AFN.121007.86; it was lowest (AFN.104098.61) for small farmers and highest (AFN.138901.42) for large farmers.

- 5) The average yield of potato for the selected farmers was 284.92 bag per hectare, the yield was lowest for small farmer (281.34 bag) and highest for large farmers (288.68 bag). The gross income per hectares was AFN.257917.86 for selected farmers. It ranged from AFN.251462.80 for small farmers to AFN.262435.69 for large farmers. On an average, potato cultivators realized net income of AFN.136910.02 from one hectare of potato cultivation. It was AFN.147364.18, AFN.139831.62 and AFN.123534.26 per hectare for small, medium and large farmers, respectively.

Constraints Faced by The Farmers in Production and Marketing of Potato

- 1) The major constraints faced by the farmers in production and marketing of potato were price instability of potato, high storage charge, uncertainty of weather, inadequate marketing facilities, spoilage of potato, unavailability of labour, lack of credit for storage facilities and non-remunerative price of potato.

6. Suggestions

- 1) The seed cost is very high, therefore it's better to produce own seed and store in cold storage.
- 2) The provision of adequate cold storage facilities in the rural areas to be provided for the potato growers.
- 3) The farmers are compelled to sell their produce in the market just after the harvest because of their immediate cash need. So adequate and timely credit facilitate may be provided to potato growers through institutional agencies.
- 4) The rent of cold storage is very high so government should try to reduce the storage charge.
- 5) Government should declare support price for potato and purchase the same if market price falls below the level.
- 6) Contract farming is better and increases knowledge level of farmers so government should pave the ground for connecting private sectors and potato growers.

Appendix 1: Retail market price of potato in provincial centers from Jan-Dec 2015

			Jan	Feb	Mar	Apr	Ma y	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
S N	Regio n	Provi nce	Pota to	Pota to	Pota to	Pota to	Pota to	Pota to	Pota to	Pota to	Pota to	Pota to	Pota to	Pota to	
			(Afs /kg)	(Afs /kg)	(Afs /kg)	(Afs /kg)	(Afs /kg)	(Afs /kg)	(Afs /kg)	(Afs /kg)	(Afs /kg)	(Afs /kg)	(Afs /kg)	(Afs /kg)	(Afs /kg)
1	North	Farya b	30	20	16	15	15	20	20.0	20.0	20	20	20.0	20.0	19.6
2	North	Juzjan	34	15	15	15	15	15	15.0	17.0	20	20	18.0	17.0	18.0
3	North	Sar-i- Pul	25	18	18	15	13	15	17.0	18.0	16	15	15.0	14.3	16.6
4	North	Balkh	25	20	16	18	15	20	20.0	15.0	16	16	15.7	15.7	17.7
5	North	Sama ngan	25	20	15	15	15	15	15.0	12.0	15	15	15.0	15.0	16.0
6	North- East	Bughl an	25	15	15	15	14	15	14.0	13.0	12	13	12.1	13.0	14.7
7	North- East	Kund uz	25.5	18	17	14	17	17	14.5	14.0	14	14	15.7	17.0	16.5
8	North- East	Takha r	22	15	17	15	13	14	12.0	13.0	13	14	14.0	14.0	14.6
9	North- East	Badak hshan		25	22	18	22	18	17.0	14.0	13	13	14.3	17.1	17.6
1 0	West	Heart	20	15	15	13	12	13	20.0	15.0	13	15	15.0	15.0	15.0
1 1	West	Farah		16	12	14	12	12	20.0	15.0	11	17	13.0	13.0	14.1
1 2	West	Badg his	30	15	15	15	15	15	20.0	20.0	20	20	20.0	20.0	18.8
1 3	West- Centra l	Ghor	25	25	25	20	20	20	20.0	20.0	20	20	20.0	20.0	21.3
1 4	West- Centra l	Bamy an		18	18	18	15	20	20.0	25.0	15	15	10.0	15.0	17.2
1 5	Centra l	Kabul	25	16	15	12	12	13	14.0	14.0	11	14	12.9	15.7	14.6
1 6	Centra l	Parwa n	14.2	14.2	11.4	10	12	13	14.2	11.0	15	15	11.4	11.4	12.7
1 7	Centra l	Panjs heer	20	20	20	12	12	15	15.0	15.0	15	20	21.0	18.0	16.9
1 8	Centra l	Kapis a	22	14	14	10	12	13	13.0	12.0	14	12	15.0	15.0	13.8
1 9	Centra l	Logar	26	15	15	15	15	12	12.0	12.0	11	11	13.0	13.0	14.2
2 0	Centra l	Ward ak	20	14	14	14	13	14	12.0	12.0	10	12	12.9	13.0	13.4
2 1	South	Pakty a	20	18	18	12	12	12.5	12.5	13.0	14	15	14.5	15.5	14.7
2 2	South	Paktik a	20	15	14	11	12	16	16.0	16.0	16	15	14.0	12.0	14.8
2 3	South	Khost	16	15	12	10	12	12.7	12.0	15.0	14	14	12.3	13.6	13.2

24	South	Ghazni	25	12	12	12	12	15	17.0	13.0		15		14.0	14.7
25	East	Nangarhar	28	12	11	14	12	13	15.0	19.0	16	16	19.4	22.7	16.5
26	East	Laghman	16	12	11	9	12	12	12.0	12.0	12	14		14.0	12.4
27	East	Kunarha	30	30	13	25	22	15	15.0	15.0	20	20	25.0	20.0	20.8
28	East	Nooristan	28	28	28	28	26	27	27.0	27.0	27	27	26.5	26.5	27.1
29	South-West	Kandahar	14	13	21	21	12	12	12.0	13.0	13	16	15.6	13.3	14.6
30	South-West	Helmend	37		12.5	13	14	12.5	12.5	15.0	18	18	18.0	25.4	17.8
31	South-West	Zabul	24	20	12	12	12	12	13.0	14.0	16	15	14.3	13.7	14.8
32	South-West	Nimroz	25	25	20		18	18	18.0	19.0	20	21	20.0	20.0	20.4
33	South-West	Uruzgan	30	25	25	24	20	23	21.0	20.0	20	16	16.0	16.0	21.3
34	South-West	Daikunde	40	40	40	40	40	40	40.0	40.0	40	40	40.0	40.0	40.0
Average of January			24.7	18.5	16.9	15.8	15.4	16.2	16.7	16.4	16	17	16.9	17.0	17.3
Average of last month			17.0	24.7	18.5	16.9	15.8	15.4	16.2	16.7	16.4	16.0	17.0	16.9	17.3
%Change of last month			45.5	-25.0	-8.8	-6.4	-2.5	4.7	3.3	-1.7	-0.5	5.1	-0.8	0.5	0.0

Appendix 2: Average Retail Market prices in central provinces of Afghanistan, 2015-16

SN	Region	Province	Average
1	North	Faryab	19.6
2	North	Juzjan	18.0
3	North	Sar-i-Pul	16.6
4	North	Balkh	17.7
5	North	Samangan	16.0
6	North-East	Bughlan	14.7
7	North-East	Kunduz	16.5
8	North-East	Takhar	14.6
9	North-East	Badakhshan	17.6
10	West	Heart	15.0
11	West	Farah	14.1
12	West	Badghis	18.8
13	West-Central	Ghor	21.3
14	West-Central	Bamyan	17.2
15	Central	Kabul	14.6
16	Central	Parwan	12.7
17	Central	Panjsheer	16.9

18	Central	Kapisa	13.8
19	Central	Logar	14.2
20	Central	Wardak	13.4
21	South	Paktya	14.7
22	South	Paktika	14.8
23	South	Khost	13.2
24	South	Ghazni	14.7
25	East	Nangarhar	16.5
26	East	Laghman	12.4
27	East	Kunarha	20.8
28	East	Nooristan	27.1
29	South-West	Kandahar	14.6
30	South-West	Helmand	17.8
31	South-West	Zabul	14.8
32	South-West	Nimroz	20.4
33	South-West	Uruzgan	21.3
34	South-West	Daikunde	40.0

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