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# Farmers Income Enhancement through Off-Season Vegetables Production under Natural Environment in Swat-Pakistan

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**ABSTRACT**
An experimental project entitled "Income enhancement of farmers through off season vegetables production under natural environment in Swat-Pakistan" was conducted at district Swat in Farm Services Centre Madyan (FSC) with the collaboration of Agriculture Extension Department Swat during *Kharif* season 2014. The field experiment was carried out in randomized complete block design (RCBD) having 600 plots at different location and altitudes. The sub plot size was kept 1 kanal in each vegetable plot. Tomato was planted on an area of 185 kanals, cucumber was grown on an area of 103 kanals, French bean was grown on 225 kanals, squashes was on 62 and peas were on 25 kanals in all the three location. From the results it is observed that all types of vegetable cultivars positively responded for high yield at different location and altitude. Maximum yield of Tomato and Cucumber (1026.8 and 1124.8 kg kanal$^{-1}$) was recorded in Kalam location. While in Behrain, Squashes and Peas produced highest yield (894.3 and 482.1 kg kanal$^{-1}$). In Madyan, highest yield was observed in French bean (784.6 kg kanal$^{-1}$). Kalam valley temperature was a little bit varied in vegetable growing season. There were 15-20 days difference was recorded in crop germination, development and growth in different location due to different altitudes in Madyan, Behrain and in Kalam. On the basis of above result it was concluded that Swat valley; Specially Upper Swat is most suitable for Off-season vegetable production under natural environment to enhance the socio-economic condition of the farmer community.
**Keywords**: Off-season, vegetables, natural environment, location, altitude, FSC

## INTRODUCTION

Importance of vegetable in human diet cannot be ignored. These are the major helpful source for digestion process. Vegetables provide vitamins and minerals and also help to control cholesterol in our body. Swat soils have capability to produce many vegetables (Sohail, 2006). We have a long list of winter and summer vegetables. As population of the world increases and land resources are decreases day by day. So vegetables production in off season is the chief idea to overcome on hunger and food security. Some important features of off-season vegetables are discussed. Cucumber is the most famous off-season crop. It is being uses as salad and famous for low- caloric value. The fruit are picked before maturity and eaten fresh. Tomato is another important crop grown in off-season. Indeterminate hybrid cultivars are preferred for growing in off-season. Yield per plant ranges from 5-6 kg. Tomatoes, aside from being tasty, are very healthy as they are a good source of vitamins A and C (Sohail, 2006). Vitamin A is important for bone growth, cell division and differentiation, for helping in the regulation of immune system and maintaining surface linings of eyes, respiratory, urinary and intestinal tracts. Vitamin C is important in forming collagen, a protein that gives structures to bones, cartilage, muscle and blood vessels (Sohail, 2006). It also helps maintain capillaries, bones and teeth and aids in the absorption of iron. Lycopene is a very powerful antioxidant which can help prevent the development of many forms of cancer. A raw tomato has about 20% of the lycopene content. However, raw or cooked tomatoes are considered the best source for this antioxidant.

Vegetable production in cold mountain regions has traditionally been limited to the domestic scene. Vegetable production promises a consistent cash flow during most of the year (Sohail, 2006). Finally, the cropping pattern in cold climatic regions has undergone a tremendous change with the introduction of off-season vegetable crops (Anonymous, 2014). Off-season vegetables and fruits growing mean improving the diet and increasing the household income. Vegetable cultivation, particularly in district Swat, has a great potential for improving income generation in the cold regions of Madyan, Behrain and Kalam. In these areas, Tomato, French bean, cucumber, Peas, Cabbages, Cauliflowers, Turnip, Radishes, Carrots, Spinach, Methi, Coriander, and Potatoes are being grown successfully. In addition to local sales, these vegetables are marketed into cities like Peshawar, Islamabad and Rawalpindi as off-season vegetables and fetch good prices. These cold areas are designated disease-free zones (Anonymous, 2014). The cold climate is very suitable for vegetable seed production. Off season vegetable production is known as a successful economic enterprise in this region. Environment of Swat district is favorable for the production of many off-season vegetables. This region has witnessed the highest yield level in Pakistan and known as horticulture zone of Pakistan (Sohail, 2006). Off-season vegetables are made available in the market 30-45 days earlier of their real season. There is a huge

demand for fresh vegetables in the local as well as international markets, which includes Europe, Middle East, and Far Eastern market. Vegetables in plain regions when starting, four harvests are completed in cold region of district Swat in order to enter the markets of the plains selling off-season vegetables. Farmers normally receive three to four times' more than normal market prices from businessmen.

Swat soils have capability to produce vegetable in such a huge amount that these can be exported. Establishment of markets is needed to handle production. Government as well as foreign donors should practically help the interested farmers and should provide basic facility to producers that they might be able to increase vegetable production of district Swat. If it will happen I assure Pakistan would be one of the biggest exporter in field of Agriculture and particularly in horticulture. The main goal of the project was to improve the socio economic conditions of the farming community of Madyan, Behrain and Kalam by reducing the cost of production on vegetables and increase in production and incomes through implementation of good agriculture practices, increasing food security at household level and reducing susceptibility to extreme poverty.

## MATERIAL AND METHODS

An experimental project entitled "Introduction and promotion of off-season vegetables production under natural environment in hilly area of Swat-Pakistan" was conducted at district Swat in Farm Services Centre, Madyan (FSC) with the collaboration of Agriculture Extension Department Swat during *Kharif* season 2014. In FSC Madyan including Madyan, Behrain and Kalam, fertilizers and seeds of various vegetables (tomato, cucumber, French bean, squashes and peas) were distributed among more than five hundred beneficiaries (500) for an area of 600 kanals, under the IAO project Swat II (GECOHO). The field experiment was carried out in randomized complete block design (RCBD) having 600 plots at different location and altitudes. The sub plot size was kept 1 kanal in each vegetable plot. Tomato was planted on an area of 185 kanals, cucumber was grown on an area of 103 kanals, French bean was grown on 225 kanals, squashes was on 62 and peas were on 25 kanals in all the three locations. In Madyan total 98 famers were benefited from IAO project out of 500 while most of the farmers were benefited in Behrain (308 beneficiaries) whereas 97 farmers were benefited in Kalam. The most suitable area for off-season vegetable production was found Behrain. While in Madyan and kalam temperature was a little bit varied in vegetable growing season. There were 15-20 days difference was recorded in crop germination, development and growth in different location due to different altitudes in Madyan, Behrain and in Kalam.

All data collected were subjected to analysis of variance (ANOVA) with the help of statistical software, Statistix 8.0 USA (2005). Upon significant F-Test, least significance difference (LSD) test was used for mean comparison to identify the significant components of the treatment means.

## RESULTS AND DISCUSSION

### *Market price (PKR)*

The market rate was much higher in early picking because most of the crops were not matured in all location and in few areas crops were ready to market supply therefore supply to market was limited and market rate was high. Maturity varied from location to location and from altitude to altitude. With the passage of time most of the crops become matured in different altitude and locations and supply to market increased and ultimately market rate reduced. The brief discussion of each vegetable, planted area in each Union council, total production in each Union council and average net income are presented in the following tables.

***Table.3 Variation in market price of different off-vegetables during the whole season***

| Vegetable kind | Initial market rate | Mid-market rate | Final market rate | Avg price $Kg^{-1}$ |
|---|---|---|---|---|
| 1.Tomato | 500 / 10 kg bag | 350 / 10 kg bag | 300 / 10 kg bag | 38.333 PKR |
| 2.Cucumber | 1000 / 40 kg bag | 900/ 40 kg bag | 900/ 40 kg bag | 23.33 PKR |
| 3.FrenchBean | 2200 / 30 kg bag | 1800/ 30 kg bag | 1600/ 30 kg bag | 62.22 PKR |
| 4.Squashes | 450 / 10 kg karat | 400/ 10 kg karat | 380/ 10 kg karat | 41.00 PKR |
| 5.Peas | 4200/ 35 kg bag | 3700 /35 kg bag | 3200/ 35 kg bag | 105.71 PKR |

### *Total area under cultivation*

The yield of all vegetable plots were noted in all villages under the IAO project and was enhanced many folds due to provision of technical guidance, quality seed, and Optimum fertilizer application as compared to their traditional practices. And ultimately the income was linearly increased with the production of vegetables. The market rate was evaluated from different firms and growers of the locality as well as from big markets. The growers earned a huge income from much vegetable production and from their suitable time of advertising. The farmers were randomly contacted to evaluate increase or decrease in their net income from vegetables plots demonstrated by Agriculture Extension department with Collaboration of IAO. The net income was enhanced up to 80 % in many location and villages under the IAO project. During the whole season, up and down was recorded in market rate. In initial picking of vegetables the market rate was found much higher, and with the

 

passage of time a linear decrease was noted in market rate of various vegetables.

***Table.1 Total area (k) under cultivation of different vegetables, number of beneficiaries and average yield (kg $k^{-1}$) in all villages under IAO Activities.***

| Vegetables | Cultivars | Seed rate $k^{-1}$ | Total Area (K) | No of Beneficiaries | Avg yield(kg) $k^{-1}$ | Total yield(kg) |
|---|---|---|---|---|---|---|
| 1.Tomato | Riogrand | 50 g | 185 | 153 | 986.46 | 182495.1 kg |
| 2.Cucumber | Rohini | 30g | 103 | 95 | 1089.43 | 112211.29 kg |
| 3.FrenchBean | Paulista | 1kg | 225 | 190 | 748.13 | 168329.25 kg |
| 4.Squashes | Asma F1 | 50g | 62 | 51 | 887.06 | 54997.72kg |
| 5.Peas | Climax | 4kg | 25 | 11 | 467.23 | 11680.75 kg |

***Average yield (kg kanal$^{-1}$)***

The average yield and average income was calculated of the each farmer and concluded that the income of majority growers increased near to double of their previous income. The farmers of the locality appreciated very deeply the IAO and Agriculture Extension department support for the development of socio-economic condition of the farmer community. Market rate analysis was calculated and find out the average market price in kg of each vegetables. Early picking, mid and final picking market rate was noted and then averaged of all the vegetables. The following table represents variation in Market rate of different vegetables from first picking to last picking.

***Table.2 Average yield data and average market rate per kg of different vegetables***

| Vegetables kind | Average yield (kg $k^{-1}$) | Average price $kg^{-1}$ |
|---|---|---|
| 1.Tomato | 986.46 | 38.333 PKR |
| 2.Cucumber | 1089.43 | 23.33 PKR |
| 3.FrenchBean | 748.13 | 62.22 PKR |
| 4.Squashes | 887.06 | 41.00 PKR |
| 5.Peas | 467.23 | 105.71 PKR |

***Average yield (Total yield per Union Council)***

The average yield was calculated of the each farmer and then averaged. Early picking, mid and final picking yield was added. The data showed that in early picking yield was low as compared to second and third picking. As the number of picking increase from third to fourth, the yield data was decreased linearly.

***Table.4 The averages yield data (kg k-1) of different vegetables inMadyan, Behrain and Kalam***

| Vegetables | Union Councils | | | Mean (kg) |
|---|---|---|---|---|
| | Madyan | Behrain | Kalam | |
| 1.Tomato | 936.0kg | 996.6kg | 1026.8kg | 986.46 |
| 2.Cucumber | 1049.7kg | 1093.8kg | 1124.8kg | 1089.43 |
| 3.FrenchBean | 784.6kg | 719.8kg | 740.0kg | 748.13 |
| 4.Squashes | 878.6kg | 894.3kg | 888.3 kg | 887.06 |
| 5.Peas | 456.8kg | 482.1kg | 462.8 kg | 467.23 |

 

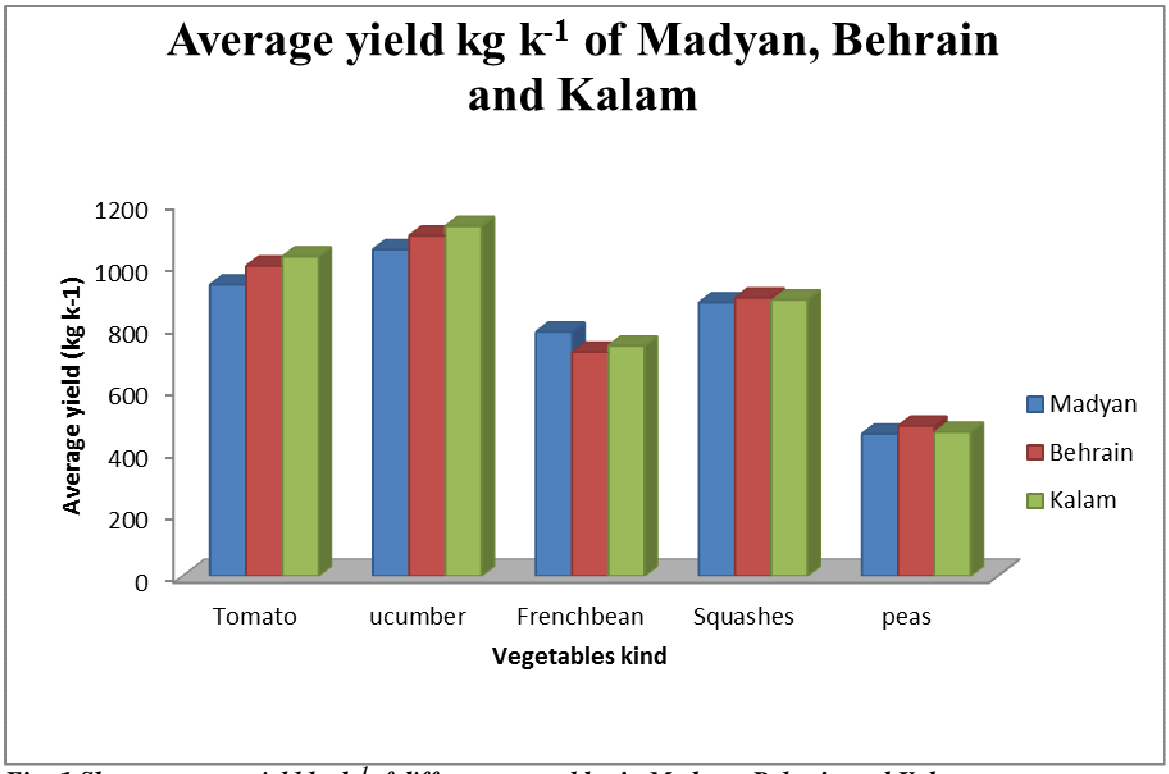


***Fig: 1 Shows average yield kg k [1]of different vegetables in Madyan, Behrain and Kalam***

1. ***Tomato***
   Tomato was grown successfully on total area of 185kanals with 153 beneficiaries in the three different union councils of Madyan, Behrain and Kalam. It was planted on 2nd large area after French bean in the all UCs of under the project. In UC Madyan tomato was planted on 38 kanalswith its average production of 936 kg $k^{-1}$ whereas in Behrain it was planted on an area of 137 kanals with the average production of 996.6 kg $k^{-1}$. In Behrain Tomato was planted on large area as compared with other vegetables and found more productive as compared with Madyan. In Kalam tomato was planted on very small area of 10kanals and produced highest yield (1026.8 kg $K^{-1}$) among Madyan, Behrain and Kalam.

2. ***Cucumber***
   Cucumber is one of the best crop grown successfully in off-season. Total area under cucumber cultivation was 103kanals with 95 beneficiaries in all UCs. It was planted on an area of 17 kanals out of 103 in UC Madyan with the average production of 1049.7 kg $k^{-1}$while in UC Behrain it was cultivated on an areaof 44 kanals. The average yield was much better in Behrain as compared with Madyan and produced 1093.8 kg yield $k^{-1}$. In UC Kalam cucumber responded positively in term of yield and produced highest yield 1124.8 kg $k^{-1}$ among all UCs. It was planted in Kalam on an area of 42 kanals in all UCs under the project activity.

 

### 3. *French bean*

French bean was grown on large area among all vegetables under the project activity. It covered total area of 225kanals and 190 farmers were benefited in all UCs. In UC Madyan French bean was planted on an area of 54 kanals and produced highest average yield of 784.6 kg $k^{-1}$ among all UCs of Madyan, Behrain and Kalam, whereas maximum area covered by French bean was observed in UC Behrain and planted on 136 kanals. The average production was noted 719.8 kg $k^{-1}$which was reduced 9% as compared to Madyan. In Kalam it was planted on 35kanals and average production (740kg $k^{-1}$) was found higher than that of Behrain.

### 4. *Squashes*

Total area under squashes was 62kanalswith 51 beneficiaries in all UCs under the IAO project. Most of the squashes were grown in Behrain on an area of 39kanals followed by Kalam with the area of 22kanals and only one kanal plot was cultivated in UC Madyan. Highest yield of 894.3 kg $k^{-1}$ was recorded in Behrain followed by kalam produced 888.3 kg $k^{-1}$.

### 5. *Peas*

Peas were cultivated on very limited area of 25 kanals with 11 benificiries in all UCs under the project

 

activity. It is more valuable and productive crop with a high market price. Peas were planted on an area of 9 kanals in UC Madyan with an average production of 456.8 kg $k^{-1}$. In Behrain it was cultivated on only 04 kanals with the average production of 482.1 kg $k^{-1}$. The average production in Behrain was found highest among all UCs while in Kalam peas were planted on an area of 12 kanals with the average production of 462.8 kg $k^{-1}$.

***Table.5 The Area (Kanals) covered by each crop in Madyan, Behrain and Kalam***

| Vegetables | Area in kanals | | | Total area |
|---|---|---|---|---|
| | Madyan | Behrain | Kalam | |
| 1. Tomato | 38 | 137 | 10 | 185 |
| 2. Cucumber | 17 | 44 | 42 | 103 |
| 3. FrenchBean | 54 | 136 | 35 | 225 |
| 4. Squashes | 01 | 39 | 22 | 62 |
| 5. Peas | 09 | 04 | 12 | 25 |
| Total | 119 | 360 | 121 | 600 |

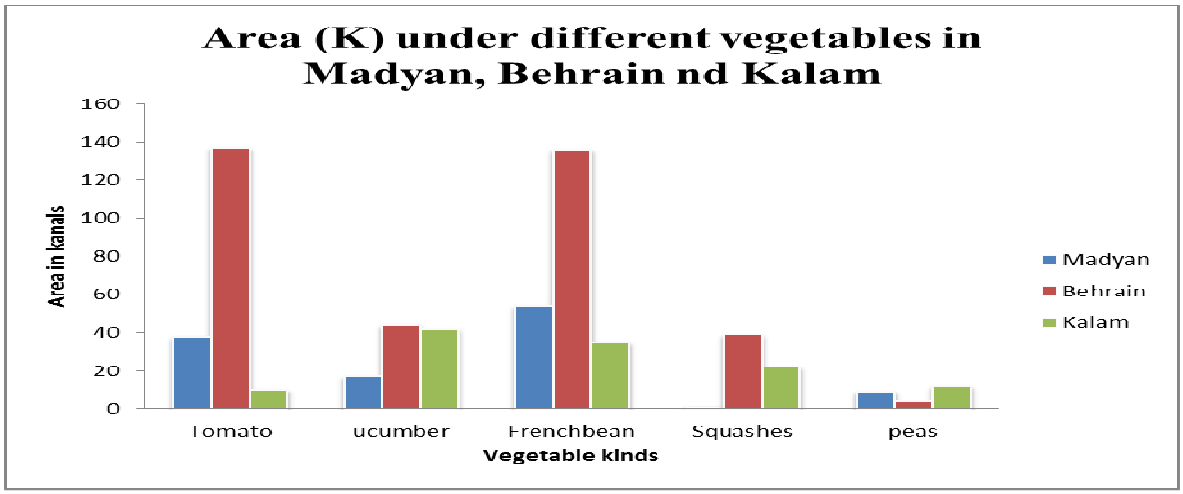


**Fig: 2 Shows area under cultivation of different vegetables in Madyan, Behrain and Kalam**

## CONCLUSION AND RECOMMENDATIONS

From the findings it is concluded that all types of vegetable cultivars positively responded for high yield at different location and altitude. Maximum yield of Tomato and Cucumber (1026.8 and 1124.8 kg $kanal^{-1}$) was recorded in Kalam location. While in Behrain, Squashes and Peas produced highest yield (894.3 and 482.1 kg $kanal^{-1}$). In Madyan, highest yield was observed in French bean (784.6 kg $kanal^{-1}$). On the basis of above result it was recommended that Swat valley, Specially Upper Swat is most suitable for Off-season vegetable production under natural environment.

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