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Poverty Alleviation Through Grass Root Based Planning and Execution of Vegetable Farming System

An Experience of HP Farmers

B. C. BISWAS and D. K. SHUKLA
The Fertiliser Association of India, New Delhi- 110 067

Poverty is a curse, which needs to be cured on the basis of top priority. Himachal Pradesh (HP) is dominated by small and marginal farmers (86%) who do not earn enough to purchase their basic needs like food, clothing etc. They, therefore, come down to plains in search of employment in the towns and cities. In India, agriculture has been the main source of employment and income for millions and it would continue to remain the mainstay of employment and income in the years to come. To make agriculture a viable means of employment and income, grass root based planning by the local people to enhance productivity through scientific agriculture and proper marketing of the produced are very important. HP soils are poor in plant nutrients. Soil acidity is also a serious problem. Water scarcity is the main limiting factor. Poor soils are always dominated by the poor people. This is universal phenomena. Therefore, efficient use of water and plant nutrient through the cultivation of the quick growing vegetable crops like cabbage and cauliflower and their efficient marketing can result in poverty alleviation of the poor farmers.

Himachal Pradesh is a small state land locked among the mountains. The geographical area of the state is about 55,673 sq kilometers **(Table 1)**. The latitude varies from 350 metres to 6975 meters. Farm size is small. The poverty is endemic and most of the farmers are living hand –to-mouth. Per capita income of H. P. is Rs. 10,942 per annum, which is significantly lower than national per capita income. Average rainfall is 1469 mm but the erratic rainfall has serious implication on the agriculture of the state. It has diverse climatic condition and it is divided in 6 climatic zones viz. sub-humid subtropical, humid tropical, wet temperate, humid temperate, sub humid temperate alpine highland and frigid aridic zone. Most of the agro-horticultural activities are practised in rainfed conditions (3). Wheat and rice are the main irrigated crops **(Table 2)**. Agricultural diversification with off-season vegetable crops has made a perceptible impact on the quality of life of rural population. This paper attempts to highlight the success story of such an endeavour under taken by the farmers of backward areas of Kangra district of HP.

Soil Fertility Status of the State

Soil condition varied greatly due to terrain, which makes it very difficult to classify the soil properly. Verma et al (6) classified the soils of the state in nine groups. These groups are alluvial, brown hill, non-calcic brown, brown podzolic, gray brown pazolic, planosolic, humus and iron podzals, alpine humus mountain skeletal, alpine humus mountain in Kinnaur, Lahual and alpine humus mountain in Chamba district **(Table 3)**. To evaluate the soil fertility status of H. P. soils a large number of soil samples were analysed. Soils of Una, Hamirpur were low in available nitrogen and of Kangra, Mandi, Bilaspur, Simla and Sirmaur are medium. Available P was rated low in Kangra, Una and Shimla districts while Hamirpur, Solan, Kinnaur, Kullu, Mandi and Sirmaur were medium. Available potassium was medium to high in most of the districts. As soil of H. P. is acidic in nature generally calcium deficiency was a common phenomena. Magnesium and sulphur deficiency were also observed in some acid soils. Amongst micronutrients zinc and copper deficiencies were widespread. About 70% soil samples are reported to be zinc deficient.

About 20 per cent of the gross cropped area is irrigated **(Table 1)**. The crops grown in the state are rice, maize, wheat, vegetables and fruits. But the productivity of various crops is quite low **(Table 4)** because of lack of irrigation facilities and low and imbalanced use of fertilisers. The

Table 1 – Land use pattern in Himachal Pradesh (Area in m ha)

Total geographical area	5.57
Reporting area for land utilisation statistics	4.54
Net cropped area (NCA)	0.54
Gross cropped area	0.95
Net irrigated area	0.10
Gross irrigated area	0.18
% of NIA to NCA	20
Cropping intensity	173.9

Source : (6)

Table 2 – Irrigated area under different important crops

Crop	Area ('000 ha)
Wheat	60
Rice	52
Others	49
Total	161

Source: (6)

Table 3 – Selected characteristics of soils groups of Himachal Pradesh

Sl.No.	Soil group	Colour	Sand (%)	Slit (%)	Clay (%)	Texture class	pH	O.M. (%)	C/N (ratio)	CEC (me/ 100 g)	Base saturation (%)	Free Fe_2O_3 (%)
1	Alluvial soil	10YR 4/4-6/3	70	20	10	s1	7.5	1	8	10.1	92	4.5
2	Brown hill soil	10YR 3/3-4/2	43	30	23	1	6.5	2.6	12	13.4	81	4.2
3	Non-calcic brown soil	10YR 4/4-6/5	67	18	15	s1	7	1.5	8	10.8	83	1.3
4	Brown podzolic soil	10YR 3/2-5/4	44	35	21	1	5.8	3.3	11	12.4	77	1.7
5	Grey brown podzolic soil	10YR 5/4-5YR 4/4	41	37	22	1	5.6	1.8	9	10.2	45	5.5
6	Planosolic soil	10YR 5/2-2.5Y5/2	52	28	20	sc1	7	3.1	11	16.0	80	3.0
7	Humus and Iron Podzol	10YR 3/2-5/4	45	40	15	1	5.2	5.5	9	15.0	34	3.2
8	Alpine humus mountain skeletal soil	10YR 2/2-4/4	67	22	11	s1	7.2	6.2	13	16.6	80	1.0
9	Brown forest soil	10YR 3/3-5/6	49	29	26	sc1	6.5	3.3	10	11.0	73	2.5

Source: (6)

fertiliser consumption in state is very low. The lower crop yields forced endemic poverty and farmers live from hand to mouth.

Diverse climatic condition of the state provides some alternative opportunities like low temperature favourable for off season's vegetable cultivation, vegetable seed production and lower fertiliser use provides the opportunity of organic vegetable production.

Some Statistics of the State

The main problems of the state are the hilly area, problematic soils, availability of irrigation water, small holding (more than 86%), low soil fertility and low temperature, soil and water erosion, communication and marketing problems, unavailability of production inputs in time etc. Cultivated area is only 10%. Food grain production is 1.6 million tonnes. Problem soils like acid soils create problem of P availability. Main crops grown are maize, rice, wheat, potato and pears **(Table 4 & 5)**. Others vegetables grown are cabbage, carrot, cauliflower, etc. To avoid the risk of crop failure, mix cropping is the (maize+ black gram, maize+ green gram, maize+ soybean etc) dominating system adopted in the state. All temperate and sub-tropical fruits are grown in the state. Apple, pear, peach, plum, apricot, strawberry, citrus, mango, litchi, guava are important fruit crops occupying 2.23 lakh hectares and the fruit production was 6.95 lakh tonnes in 2007. Horticulture generated an income of Rs.2200 crores per annum in H.P.

Realizing the importance of horticultural crops in the state, 4 centers of excellence are being created with common facilities like water harvesting, vermin-compost, green house, and farm mechanization.

Options Available and their Proper Utilisation

The options available with the farmers are vegetable (Cole crops) farming, seed production, bee keeping, floriculture etc. Some of them are discussed below:

Table 4 – Area, production and yield of major crops in HP

Crops	Area			Production			Yield		
	2006-07	2007-08	2008-09p	2006-07	2007-08	2008-09p	2006-07	2007-08	2008-09p
TOT. FOODGRAINS	793	802	789	1488	1651	1401	1877	2058	1776
KH. FOODGRAINS	407	412	405	848	923	815	2083	2239	2014
Maize	299	298	298	695	780	677	2326	2617	2273
Rice	79	77	78	123	120	118	1559	1558	1522
Ragi	n. a.	3	3	n. a.	5	3	-	1800	1144
Millets	7	8	7	8	7	5	1143	825	763
Kharif Pulses	26	27	20	21	12	12	799	434	609
RABI FOODGRAINS	384	390	384	641	728	586	1668	1867	1525
Wheat	362	360	349	596	685	531	1647	1903	1524
Barley	24	23	20	34	35	26	1405	1556	1305
Gram	4	3	1	3	4	2	625	1400	1096
Other Rabi Pulses	8	5	14	8	5	26	961	900	1912
Other Crops									
Potato	14	14	16	163	175	174	11403	12500	10869
Vegetable	52	43	59	991	1060	1090	19047	24651	18561
Ginger	n. a.	4	4	n. a.	50	4	-	14286	1189

Source: (2)

Table 5 – Crops and varieties under optimum input availability conditions

Rotation	Yield q/ha		Rabi-II	Net return (Rs/ha)
	Kharif	Rabi		
Rice (RP 2421)-Pea (Arkel)-Frenchbean	28.65	21.88	89.79	96,985/-
Rice (RP 2421)-Radish (Japanese White)-Potato (Kufri Jeoti)	29.34	252.78	56.25	1,27,937/
Rice (RP 2421)-Wheat (HPW 155)	30.12	28.13	-	18,889/-
Rice (RP2421)- Potato (Kufri Jeoti)	29.63	101.56	-	41,443/-
Rice (RP 2421)-Gobhi Sarson (Sheetal)	32.97	6.76	-	12,092/-

Source : Annual Report Department of Agronomy 2004-05, H. P.

Cultivations of Some Cole Crops

Cabbage (Brassica oleracea var. capitata)

Cabbage is an important vegetable of cole group but it is now being grown throughout the year. It is a hardy cool season annual crop when grown for vegetable and biennial when grown for seed production. Cabbage is very convenient to grow both on large and small-scale (kitchen garden) cultivation. Cabbage is grown throughout the country but it is more popular in Southern States where it is available all the year round. In northern India also, the cabbage availability period has been considerably extended with the development of tropical varieties/hybrids.

For better yield and quality, the crop should be fertilised well during early stage of growth. Though the manure and fertiliser requirements may vary from soil to soil and from variety to variety, normally 20 to 25 tonnes of farmyard manure per hectare should be mixed in the soil 3 to 4 weeks before transplanting the crop. Before transplanting, 60 kg nitrogen, 80 kg phosphorus and 80 kg potash per hectare should be added. The crop should be top dressed with urea at the rate of 60 kg nitrogen per hectare. To check boron deficiency, 10 to 15 kg borax per hectare should also be added during field preparation. Borax, at the rate of 1kg per hectare, can also be sprayed on plants one month after transplanting.

The yield of cabbage varieties greatly depends on choice of cultivar, climatic conditions, management practices, etc. The early maturing and tropical cultivars produce lower yields (200–250q/ha) due to shorter growing season while midseason and late varieties give much higher yields (350-450q/ha) because of favourable cooler climate for long period.

The marketable heads can be stored for 2-3 weeks if arranged in crates and placed in well-ventilated place. They can be stored for several weeks in the Cold Storage at 0^0C to 1.7^0C with 85 to 87% relative humidity.

Cauliflower (Brassica oleracea var. botrytis)

Cauliflower can be grown during winter in high ranges. Since it is a cool season crop, sowing is to be done from Aug-Nov. However, farmers are also growing it as a late and early season crop. Well-drained sandy loams to clay loam soils with pH 6 to 7 are suited for the crop. Seed rate is 600-750 g/ha. Seeds are to be sown in nursery beds. Three to five week old seedlings are used for transplanting. Field is prepared by three or four ploughings. Seedlings are transplanted at a spacing of 60 x 45 cm. FYM or compost @ 25 tonnes/ha and fertilisers @ 120-150:50-80:80-120 N: P_2O_5:K_2O kg/ha are applied. Full dose of P_2O_5 and half dose of N and K_2O before transplanting and remaining N and K one month after transplanting are added. After cultivation a continuous supply of moisture is necessary for proper development of curds. Very shallow hoeing should be done to remove the weeds and to loosen the soil for better aeration. In order to produce large curds, earthing up the plant one month after transplanting is needed.

The yield varies greatly depending upon the variety and time of maturity. The early-maturing varieties have an average yield of 60-100 q/ha. However, mid and late varieties (maturing during November-February) yield 250-300 q/ha.

An Experience of Vegetable Farming

The story of crop diversification in some panchayats in Kangra district **(Figure 1)** started years back in 2000-01 when a Gorkha farmer from Lahaul and Spiti came to Kothikohar village and took some lands on lease from the villagers. The villagers gave him land for cultivation free of rent but with the conditions that he would hire local labour for vegetable cultivation and teach them methods of growing these crops. He stayed in the village for two crop seasons. A farmer of the same village invested money for this purpose. In the initial years, the farmer could not make profit despite bumper crop because of lack of marketing infrastructure and poor road network and thus gave up cultivation of vegetable crops. Likewise, another farmer from Banjar area of Kullu district also came to village in 2001-02 and leased-in land on nominal rent for growing vegetable crops for one season. These two farmers successfully raised cabbage and cauliflower and made handsome profits. The local villagers after getting convinced

Figure 1 – Map of Himachal Pradesh Districts

about profitability of these crops and learning some basic principles of growing these crops started cultivating them in 2002-03. After four five years in 2006, all farmers, including marginal and sub-marginal with land as low as 0.2 hectare (5 kanals), have switched over to cultivation of off-season vegetable crops. The process of transformation is nearly complete in Kothikohar, Baragran and Dharman, and it is fast catching up in remaining panchayats except Bara Bhangal. The process of crop diversification, has, however, not spread to Kothi Swar valley, because of, among other things, low level of literacy and lack of awareness among farmers (5).

Cropping Pattern and Production Levels

The main crops grown are cabbage, cauliflower, radish, rajmash and potato. Cabbage is the most important crop and 'Sanjeevani', 'Pushkar' and 'Pragati' are important hybrids. Cauliflower comes next and 'Shweta', 'Chandani' and 'Paheja' are common varieties. These corps are grown between 1800 meters to 3000 meters above mean sea-level. The cropping season extends from April to October. The use of fertilisers and plant protection chemicals is very low. The huge increase in area under cabbage and cauliflower was accompanied by significant decrease in area under traditional crops like maize and minor millets and winter wheat. Potato has remained a traditional cash crop in the area, but registered a significant decrease in the last three years **(Table 6)**. The average yield of cauliflower, cabbage and radish is 22 tonnes/ ha, 25 tonnes/ha and 30 tonnes/ ha, respectively. The average yield of rajmash (broad bean) is 0.7 tonne / ha. According to one estimate, these panchayats sold vegetable worth Rs. 1.50 crore in 2006, which was expected to increase to more than Rs. 2 crore in the next year. More recently, the state Department of Agriculture has started supplying necessary inputs like seeds, plant protection chemicals and technical guidance to local farmers. The State Agriculture Department is trying to issue soil health card (SHC) to farmers. The efforts are also being made to introduce peas, beetroot and broccoli. The local farmers are now ready to venture into other productive activities like mushroom, trout fish farming, etc. While there has been a huge increase in production of cabbage and cauliflower, the production of traditional cash crops i.e. potato and rajmash, have experienced huge fall **(Table 7)**.

Table 6 – Area under vegetable crops 2003-04 to 2006-07 (percent of gross cropped area)

Crops	2003-04	2006-07
Cabbage	12.00	50.00
Cauliflower	3.00	30.00
Potato	25.00	1.00
Radish		8.50
Turnip		1.00
Coriander		0.50
Maize & minor millets	10.00	0.50
Winter wheat	13.00	0.50
Rajmash (Broad bean)	37.00	8.00
All crops	100	100

Source: (5)

Table 7 – Change in the production of vegetable crops, 2003-04 to 2006-07 (tonne)

Crops	2003-04	2006-07	Percent increase
Cabbage	675	2,240	231.86
Cauliflower	225	1,250	455.56
Potato	20,000	1,000	-95.00
Radish		1,200	
Turnip		600	
Coriander (Fresh leaves)		10	
Rajmash	280	65	-76.79

Source : (5)

Organised Marketing

Many a time due to lack of organised marketing facilities farmers fail to make profit by growing vegetables. The case is different here. Local youth from different villages have formed small informal groups and have started marketing crops in near by towns like Kangra, Joginder Nagar, Baijnath, Palampur, Jassur and also in Pathankot, Jalandhar, Delhi and Ganganagar. Around 50% of the produce is marketed through this channel. The remaining 50% is sold in villages to traders both local and from outside. More importantly, however, according to villagers, if the price offered by traders is lower than the prevailing in the markets, they do not sell. The marketing season starts from middle of August and continues till middle of October. The vehicles collect produce in evening and sell the same next day early morning in different markets. The distance of the main markets where around 85% of the produce is sold vary between 80 and 150 kilometers **(Table 8)**.

Generation of Employment, Income and Poverty Alleviation

On an average, even a sub-marginal farmer having land as low as 0.2 hectare earns a net income of Rs. 10,000/- to Rs. 15,000/- per crop season and is in a position to meet his basic needs. There are other noticeable impacts in terms of better houses, coming up of three private English medium schools in the area to which local people have started sending their children, purchase of maxi cabs, installation of dish antennas, increase in number of telephones (both landlines and cellular), and so on. There has been a threefold increase in average household income, manifested in significant decrease in proportion of household below poverty line, which has declined from as high as 50% to as low as 10%. Likewise, there is a huge increase in the number of employment days both for farmer households, who are growing vegetable crops, and others involved in marketing activities **(Table 9)**. Besides, the cultivation of these crops has also generated a very high level of awareness among farmers and most of the farmers with whom discussion was held were going for soil testing and were interested to see other areas where cultivation of these crops is being practised for a long time (5).

Table 8 – Important markets where the produce was sold during 2006-07

Markets	percent of produce sold
Kangra	20.00
Joginder nagar	7.00
Baijnath	7.00
Palampur	10.00
Jassur	5.00
Pathankot	35.00
Amritsar	5.00
Jallandhar	5.00
Delhi	1.00
Others	5.00

Source: (5)

Women Empowerment

Table 9 – Economic impact of vegetable cultivation

Crops	2003-04	2006-07
Average household income (Rs/household)	15,000	45,000
Average household consumption (Rs/household)	10,000	30,000
Poor households (per cent)	50.00	10.00
Employment days (No. annum)	50.00	200.00
Families migrated (%)	75.00	10.00
Telephones (% of household)		10.00
Television (per of household)		60.00
Pick-up vans and multipurpose vehicles (No.)		15.00
Employment days created in marketing of produce (No./annum)		4,000

Source : (5)

Households where there is no male member in the family, the women members have undertaken cultivation of these crops. They spend money on buying basic necessities and comforts of life and send their children to private English medium schools. For example, Shiv Devi, a lady aged around 35 from Sarlah village in Dharman panchayat, has taken up the cultivation of vegetable crops like radish and cabbage. Last year, she earned a net income of Rs. 25,000 by selling radish alone. This is an interesting and encouraging example, which is expected to motivate many more farmers. Vegetable consumption (per capita) in India is only 130 gm against the needed 300 gm implies that there is a huge potential to increase vegetable production to meet the need (1).

Constraints and Remedies

Lack of irrigation facilities is the most important problem; though there is a huge irrigation potential in the area because of the availability of snow fed perennial rivers / streams. Another important problem is the lack of metalled roads. The road beyond Barot is un-metalled and gets blocked due to heavy rains and landslides in rainy season, which happens to be the harvesting and marketing season. The cost of transporting these crops from fields to road head is very high, approximately one rupee per kilogram. A watershed programme is proposed to be implemented in these panchayats to augment irrigation facilities and promote conservation of water. Hopefully, the project would see the light of the day soon and enormous benefits would be derived to the people of the locality (3).

Life Saving Irrigation

In a standing crop only rain is the ultimate source to recharge soil profile. Rainfall is a random phenomenon and is limited to few months with unpredictable distribution. Any attempt to build and efficiently use the profile water through run off recycling, use of mulches, off season tillage and fertiliser use should always be encouraged to get higher yield and profit.

In-situ Water Harvesting

It is inexpensive and can be achieved by

land configuration into ridges and furrows either prior to sowing or with eventual cultural operations. Also broad beds on grades could be formed. Graded boarder strops, compartmentalized bunding, dead furrows, inter row water harvesting and inter plot water harvesting are some practical examples. Full advantages through its adoption can only be achieved if all other three vital components like credits, technology and marketing are ensured. These systems are indeed found to be efficient only at specific locations in the state (3).

Roof-water Harvesting

Rainwater from perennial rivers, springs and rooftops of the buildings can be collected and stored in the storage tanks. The government of Himachal Pradesh has also issued directive in this regards and made its implementation mandatory in urban areas. Under these directives water tanks are required to be constructed for each 1 m^2 of roof top should have 20 liters of rain water storage, so a house having 200 m^2 area would have to make a provision for at least 2,000 liters water tank. The water so collected could be used for toilet and washing purposes. According to one of the estimate every 600 m^2 roof area in the state has enormous potential of 12 lakh liters of water, which could be collected every year, and can be used for domestic and agricultural purposes. The water collected will be adequate to apply life-saving irrigation or pre-sown irrigation for one ha area (3).

CONCLUSIONS

Right to information (RTI) and right to education (RTE) are in operation. Bill on right to food also would be passed in future. Unfortunately about 40 per cent of our population is below the poverty line that can not afford to purchase the needed food.

Profitable venture like cultivation of off-season vegetables will go a long way in removing the poverty of the poor of HP. In plain because of high temperature in summer, it is difficult to grow cool weather loving vegetables. In HP where temperature remains low in summer, farmers should slowly go in for vegetable cultivation. God willing, marketing and other infrastructure facilities would slowly be developed to bring the produce to big cities in plain where vegetable price sky rockets during summer. With the improvement of financial condition of farmers, the inputs (includes fertilisers) purchasing power of farmers will increase. This would result in higher use of fertiliser nutrients

FUTURE LINES OF WORK

1. Work on the poverty alleviation through appropriate farming system is the need of the hour. These needs to propogated.

2. Vegetable farming is profitable provided proper marketing systems exist. Therefore, organised marketing system has to be developed with the help of local youth and energetic people.

3. Supply of inputs like good quality seeds, water, and plants nutrients in time and at affordable price is essential.

4. Organised efforts at the village level through the help and support of KVK would go a long way in improving the present situation.

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