

# Watershed and Small Entrepreneurship Development: A Case of Kadwanchi Village of Jalana District of Maharashtra, India

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## Abstract

*Kadwanchi* watershed is situated between latitude 19°53' N and longitude 76°00' E of GP 33 watershed of Godavari Watershed in Maharashtra, India. *Kadwanchi* watershed consists of three villages namely *Kadwanchi*, *Waghrul* and *Nandapur* with area 1607.64, 28.40 and 252.03 hectares respectively. *Marathwada Sheti Sahayya Mandal*, A non-Government Voluntary Organization initiated extension activities from 1993 in small village *Kadwanchi*. Under Indo-German Watershed Development Program (IGWDP), the watershed activities have been carried out. Change in land use is spelled by increase in area under cultivation to 111%, seasonally irrigated two crops to 897 ha, perennial irrigation to 190%, vegetables 240%, decrease in fallow lands by 58%, increase in use of farm implements and 294 micro-irrigation sets are in use Two fold increase in crossbred cows and three-fold decrease in indigenous cows is observed due to increase in fodder availability by 1.5 times. Agriculture has shown a new avenue of small entrepreneurs like dairy industry, small processing units in the village which further spelt out employment to the village personnel's. The crop yield for pearl millet & grams is increased by 150% while area under cotton & wheat is increased from 199 to 347 and 28 to 99 hectare respectively. Area under horticulture is increased from 3 hectare to 198 hectare. As per Ground water Survey and Development Agency report 2007-08 the Kadwanchi is falls in the GP 33 watershed. This watershed fall in Semi-critical category, but Kadwanchi adjoining area 1888.7 of 9238 ha area GP-33 Watershed highly escaped from the water-scarcity, aptly called **oasis** of the desert.

## 1. Introduction

The population in India is expected to stabilize around 1640 million by the year 2050, as a result, gross per capita water availability will decline from 1820m<sup>3</sup>/yr in 2001 to as low as ~ 1140m<sup>3</sup>/year in 2050 as result, gross per capita water available will decline from ~ 1140m<sup>3</sup>/yr in 2050. Total water requirement of the country for various activities around the year 2050 has been assessed to 1450m<sup>3</sup>/yr. This is the significantly more than current estimate of utilizable water resources potential (1122m<sup>3</sup>/yr) through conventional development strategies. (S.K.Gupta, R.D.Deshpande 2004)<sup>1</sup>. To overcome the present situation watershed development approach is very important. In India, Integrated watershed development is the strategy adopted in the country for sustainable development of dry land areas and a recent comprehensive assessment of watershed programs in India undertaken by ICRISAT-led consortium revealed that integrated watershed can become the growth engine for sustainable development of dry land areas by improving the performance of 2/3<sup>rd</sup> watersheds in the country (Wani et al. 2008)<sup>2</sup>. The Kadwanchi village having population of 1,954 and 1,191 ha of cultivable land. The soils are shallow (5 -25 cm) and undulating and rainfall ranges from 220-1000 mm. It was seen that local institution support play key role in the watershed development program. Bogati,(1999)<sup>3</sup> indicated that the institutional aspect, which plays a vital role not only for effective implementation of program activities but also for the sustainability of development activities, has been ignored. It was found that the Institutional organization is very strong in the Kadwanchi Watershed Development

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Program. The top-down approach in watershed has numerous pitfalls, especially the non-involvement of watershed inhabitants in management planning, which questions the success and validity of the programs, but in Kadwanchi village mass participation play key role in bringing success.(Chambers, 1993; Brooks, 1993)<sup>4, 5</sup>. As per the mandate given by Indian Council Agriculture Research (ICAR), training of farmers, farm women, rural youth and extension functionaries, conducting Front Line Demonstrations (FLD) on oilseed, pulses and other crops, On Farm Trials (OFT), etc. were also conducted by Krishi Vigyan Kendra (kvk) in the Kadwanchi village , which brings a small revolution of entrepreneurship. Initially, awareness camps and trainings of farmers and rural youth were conducted, for motivation. Self-help groups of women were established to initiate the process of women empowerment. Field visits, *kisan melas (Farmers Campaign)*, *Mahila melavas(meetings of the women)* were organized to have constant touch with farmers to get specific feedback on problems of the village. Capacity

Building Phase (CBP) supported by GTZ-WOTR and subsequently proposed for Full Implementation Phase (FIP) supported by KfW-NABARD, under IGWDP.

## 2. Participatory Project Planning

### 2.1 Ridge to Valley approach with Socio-Technical intervention

In the promotion of people's participation, ignoring the problems associated with project implementation and institutional arrangement is a common weakness among many watershed management efforts (Thapa, 2001)<sup>6</sup>. To gain the local institutional support awareness and training programs had been undertaken .Net planning survey and drainage line survey were conducted to identify different land use patterns, land capability classification, number and stages of gullies, grade of drainage, farming practices. Socio-economic survey was undertaken as a benchmark to analyze the impact of watershed management on socio-economic aspects of villagers. In this survey income,

**Table 1** The physical achievements and financial utilization of the project

| Treatments                         | Sanctioned                 |                         | Achievements         |                          |
|------------------------------------|----------------------------|-------------------------|----------------------|--------------------------|
|                                    | Physical Units<br>(Ha/Nos) | Grant<br>Sanctioned(Rs) | Physical<br>(Ha/Nos) | Grant Sanctioned<br>(Rs) |
| <b>A. Area Treatments</b>          |                            |                         |                      |                          |
| 1.Afforestation                    | 157.71                     | 13,28,000               | 157.71               | 12,19,968                |
| 2.Agro-Forestry                    | 251.00                     | 13,74,700               | 211.00               | 9,07,694                 |
| 3.Agro-Horticulture                | 132.30                     | 8,41,800                | 132.30               | 2,98,465                 |
| 4.Crop-cultivation                 | 1000.00                    | 40,15,000               | 1000.00              | 36,03,239                |
| 5.Supervision                      | 8%                         | 5,23,000                | --                   | 3,89,071                 |
| <b>Sub-Total (A)</b>               |                            | <b>80,82,500</b>        |                      | <b>64,19,438</b>         |
| <b>B. Drainage Line Treatments</b> |                            |                         |                      |                          |
| 6.Gully Plugging                   | 3640.00                    | 5,62,480                | 4620.00              | 4,10,076                 |
| 7.Gabbions                         | 168                        | 1,29,629                | 54                   | 36,04,239                |
| 8.Check Weirs                      | 10                         | 4,89,210                | 10                   | 9,09,603                 |
| 9.Check Dams                       | 09                         | 21,76,255               | 09                   | 27,19,336                |
| 10.Repair of Nalla Bunds           | 09                         | 1,51,920                | 11                   | 53,392                   |
| 11.Supervision                     | 8%                         | 3,07,103                | --                   | 78,273                   |
| <b>Sub-Total (B)</b>               |                            | <b>39,16,597</b>        |                      | <b>42,07,052</b>         |
| <b>Total (A + B)</b>               |                            | <b>1,99,99,097</b>      |                      | <b>1,07,26,490</b>       |
| C. Project Management Overheads    |                            | 15,99,600               |                      | 15,82,370                |
| <b>Grand Total (A + B + C)</b>     |                            | <b>1,35,98,697</b>      |                      | <b>1,22,08,860</b>       |

IGWDP - Kadwanchi watershed - The treatments of the watershed were arranged accordingly the ridge to valley concept of watershed development. (The treatments differentiated i.e. 1 to 5 is specified as area treatments plays important role in water conservation as well soil conservation. The drainage line treatment (item no.6 to 11) means aims at water conservation. About Rs.42 lakh have been incurred on such treatments.)

entertainment facilities, migration, health & hygiene, kitchen sanitation, harmony among people, literacy and community-based facilities were taken into account. Project was phased for five years with 'ridge to valley' approach. Total grant utilization is Rs. 1, 22, 08,860/-, Rs. 6,466.55 per hectare and Rs. 4626.30 per head i.e. per villager.

### 1. Soil and Water Conservation

Soil and water conservation measures were undertaken in participatory and scientific manner to an extent possible considering the needs and views of the villagers.

### 2. Soil conservation treatments: These are as follows

- (a) **Trenching:** To treat the ridges, first all hilly within watershed area are treated with contour continuous trenches (CCT) followed by plantation, grass seed sowing on the soil mount. Water absorption trenches (WAT) were excavated between CCT. CCT & WAT control erosive velocity of water along with an opportunity to infiltrate the water resulting in recharging of ground water. Private wastelands were also treated with contour bunding and contour continuous trenches and dry horticulture. In all 157.71 hectares of area was treated under trenching.
- (b) **Bunding:** Land under crop cultivation (CC) was treated by proper peripheral and compartmental bunding, plantation, grass seeding on bunds and proper spillway installation to drain out excess run-off to natural drains. Compartmental and peripheral bunds serve the purpose of soil and water conservation equally and are socially acceptable. Agro-forestry, agro-horticulture was adopted along with crop cultivation in 1337.13 hectares.

### 3. Water conservation treatments

These treatments were implemented step by step from ridge to outlet of watershed drain in congruency with hydraulic conditions.

#### Water velocity retarding structures

- (a) **Gully plugging:** Gullies on hill-slopes were treated by constructing rubble gully plugs to control erosive velocity of water. Gully plugging was done also in fields emerging into gully formation. Numerous gully plugs up to 4250 m were implemented.

- (b) **Gabbion:** This structure is compact enmeshed rubble gully plug constructed in gullies at those positions where ordinary rubble gully plug cannot sustain the force of flowing water, in order to retard the velocity of runoff.

### 4. Water disposal treatments

- (a) **Ceramic pipe Bund spill way:** To dispose excess run-off of field, ceramic pipes were installed under bund at proper height and location.
- (b) **Stone bund spill way:** To dispose excess run-off from large area instead of ceramic pipes the stone spill ways were constructed at the proper location of fields.
- (c) **Water ways:** To assure safe disposal of excess water of field, artificial water ways were excavated to connect with natural drains and subsequently either it was pitched by stone or covered with grasses.

### 5. Water harvesting structures

- (a) **Earthen Nalla Bund:** Wastelands liable to come under submergence are utilized for water harvesting by making earthen embankment across the waterways. These locations provide soil for embankment. To ensure safety to nalla bund by-pass spillway is created to join upstream and down- stream of NB in U.C.R. masonry work.
- (b) **Masonry Gully Plug (MGP or check weir):** Matured gullies with minimum grade and maximum depth were installed with masonry gully plug in order to retain and to harvest water. Retaining of water for longer duration recharges the wells in surrounding and increases ground water table. In all 10 MGPs are constructed.
- (c) **Check Dam:** On large drains because of its high discharge, it is advisable to install cement concrete water harvesting structure, to sustain thrust of voluminous storage of water. It is particular to select the site with hard strata for strong foundation of check dam, or also pervious strata on upstream for recharge. Such nine check dams are constructed in the watershed area.

### 6. Vegetation protection treatment

Cattle proofing trench surrounding the vast area of fallow land, waste land and pasture land, subsequently brought

under plantation in a wake of interruption to grazing the field by cattle's. The trenches were reinforced by planting those varieties of vegetation that are abhorrent to cattle such as prosopis Juliflora, agave, parkin soniya, etc.

### 3. Result and Discussion

**1. Socio-economic changes of the project-** The land holding pattern of the kadwanchi is given below. Change in land use is spelled by increase in area under cultivation to 111%, seasonally irrigated two crops to 897 ha, perennial irrigation to 190%, decrease in fallow lands by 58%.The average land

holding pattern is increased by the 0.10 hectares in the post conditions.

**2. Change in Livestock – A small entrepreneurship development -** Increased in the fodder leads to the change in the livestock population. The cross breeds cows increased by 75 numbers. The change in agriculture technology reduced the farm animal (Bullocks) as well indigenous cows, buffalo's, sheep's and goats. The poultry industry is slightly bloomed in the Kadwanchi.

Brief analysis of the dairy industry reveals that, approximately 1200 liters milk have been collect-

**Table 2** Socio-economic changes of the project

| Sr.No  | Land holding class | Households |               | Land hold      |                |
|--|--------------------|------------|---------------|----------------|----------------|
|  |                    | Number     | % to Total    | Ha             | % to the Total |
| <b>A.</b>  |                    |            |               |                |                |
| 1  | Land less          | 81         | 8.81          | 0.00           | 0.00           |
| 2  | 0-1                | 59         | 12.97         | 42.36          | 2.74           |
| 3  | 1-2                | 124        | 27.25         | 179.58         | 11.60          |
| 4  | 3-4                | 130        | 26.57         | 350.72         | 22.85          |
| 5  | 4-8                | 67         | 14.73         | 335.88         | 21.98          |
| 6  | More than 8        | 44         | 9.67          | 589.98         | 38.10          |
| <b>Total</b>   |                    | <b>455</b> | <b>100.00</b> | <b>1548.52</b> | <b>100.00</b>  |
| Average gross land holding per household -8.40 ha.             |                    |            |               |                |                |
| <b>B. After gross land holding per household = 8.40 ha</b>     |                    |            |               |                |                |
| 1  | Land less          | 74         | 18.28         | 0.00           | 0.00           |
| 2  | 0-1                | 49         | 10.77         | 54.15          | 2.14           |
| 3  | 1-2                | 104        | 22.88         | 147.70         | 9.27           |
| 4  | 2-4                | 108        | 23.74         | 301.63         | 24.57          |
| 5  | 4-6                | 70         | 15.36         | 391.63         | 24.57          |
| 6  | More than 8        | 50         | 10.99         | 719.37         | 45.13          |
| <b>Total</b>   |                    | <b>455</b> | <b>100.00</b> | <b>1594.12</b> | <b>100.00</b>  |
| Average land holding (Dry land-cultivable) per household =8.50 |                    |            |               |                |                |

**Table 3** Change in Livestock

| Sr.No | Name                 | Previous Status | Present status |
|-------|----------------------|-----------------|----------------|
| 1     | Cross Breed cows     | 161             | 236            |
| 2     | Indigenous Cows      | 166             | 55             |
| 3     | Farm animals (Bulls) | 401             | 299            |
| 4     | Buffaloes            | 44              | 33             |
| 5     | Sheep's              | 228             | 212            |
| 6     | Goats                | 29              | 23             |
| 7     | poultry              | 109             | 309            |

**Table 5** Change in Agriculture Technology

| Sr.No. | Particulars                       | Pre-Development | Post-Development |
|--------|-----------------------------------|-----------------|------------------|
| 1      | Under Cultivated area             | 1365.95 ha      | 1517 ha          |
| 2      | Fallow Land                       | 147.03 ha       | 62.03 ha         |
| 3      | Under Two Seasonal irrigated area | 398 ha          | 897 ha           |
| 4      | Under perennial area              | 174.03 ha       | 330 ha           |
| 5      | Under vegetable Cultivation       | 107 ha          | 257 ha           |
| 6      | Tractors                          | 02 Nos          | 07 Nos           |
| 7      | Tractor operated seed drill       | Nil             | 04 Nos           |
| 8      | Threshers                         | 02 Nos          | 18 Nos           |
| 9      | Power Sprayers                    | 21 Nos          | 151 Nos          |
| 10     | Chaff Cutters                     | Nil             | 07 Nos           |
| 11     | Adjustable Harrow                 | Nil             | 08 Nos           |
| 12     | Vaibhav Sickle                    | Nil             | 110 Nos          |
| 13     | Spinkler Sets                     | 2               | 97 Nos           |
| 14     | Drip Irrigation Sets              | 7               | 197 Nos          |

ed from the milk collection centers. Considering the present scenario Rs.33,600 (1200 \* 28 Rs.) Generated from the dairy industry, strengthening the livelihood of villagers.

Two fold increase in crossbred cows and three-fold decrease in indigenous cows is observed due to increase in fodder availability by 1.5 times (Table I & VI) Agriculture has shown a new avenue to the people. Area under coarse cereals is reduced to around half and new crops are introduced like horticulture,

ginger, etc. Change in land use is spelled by increase in area under cultivation to 111%, seasonally irrigated two crops to 897 ha, perennial irrigation to 190%, vegetables 240%, decrease in fallow lands by 58%, increase in use of farm implements and 294 micro-irrigation sets are in use (Table No.VI).

- Gross income for pre and post watershed yields are calculated with current rates for comparison
- It is revealed that gross income has increased 550% as compared to the gross income in 1996-97

**Table 6** Economics of the Crop yield

| Name of Crop | Previous Status (1996-97) |                    |                           | Present Status (2001-02) |                       |                              |
|--------------|---------------------------|--------------------|---------------------------|--------------------------|-----------------------|------------------------------|
|              | Area (ha)                 | Production in Tons | Gross Income<br>00,000 Rs | Area (ha)                | Production in<br>Tons | Gross<br>Income<br>00,000 Rs |
| Pearl Millet | 526.41                    | 428.5              | 17.14                     | 303.2                    | 363.6                 | 14.54                        |
| Black Gram   | 1.4                       | 0.7                | 1.05                      | 42                       | 33.7                  | 5.05                         |
| Green Gram   | 128.31                    | 52.86              | 10.57                     | 161                      | 92.4                  | 18.48                        |
| Cotton       | 199.47                    | 125.27             | 28.81                     | 347                      | 242.9                 | 55.86                        |
| Sorghum      | 373.95                    | 209.81             | 8.39                      | 361                      | 252.7                 | 10.1                         |
| Wheat        | 27.7                      | 28.59              | 2.85                      | 99                       | 118.8                 | 11.88                        |
| Bengal Gram  | 4.8                       | 2.84               | 0.43                      | 35                       | 24.5                  | 3.67                         |
| Ginger       | Nil                       | Nil                | 0                         | 2                        | 25                    | 2.5                          |
| Grapes       | 3                         | 54                 | 8.1                       | 62                       | 1034                  | 155                          |
| Pomegranate  | 0                         | 0                  | 0                         | 98                       | 1255                  | 147                          |
| <b>Total</b> | <b>1265.04</b>            | <b>902.57</b>      | <b>77.34</b>              | <b>1510.2</b>            | <b>3412.6</b>         | <b>424.08</b>                |

**Table 7** Change in Transportation, Communication and Sanitation

| Sr.No | Particular after impact | Pre-Development | Post Development |
|-------|-------------------------|-----------------|------------------|
| 1     | Two Wheelers            | 4               | 57               |
| 2     | Gepps                   | 2               | 4                |
| 3     | Tempo                   | Nil             | 2                |
| 4     | Television              | 2               | 136              |
| 5     | Phones                  | Nil             | 25               |
| 6     | Latrines                | Nil             | 64               |
| 7     | Soak Pits               | Nil             | 14               |
| 8     | Improved Cooking Stoves | Nil             | 30               |
| 9     | L.P.Gas                 | 2               | 13               |
| 10    | Floor Mill              | 2               | 7                |
| 11    | Boring Machines (Hori)  | Nil             | 3                |
| 12    | Electric Pump sets      | 161             | 261              |

The crop yield for pearl millet & grams is increased by 150% while area under cotton & wheat is increased from 199 to 347 and 28 to 99 hectare respectively (Table VI). Area under horticulture is increased from 3 hectare to 198 hectare. These improvements were supported due to strengthening of groundwater regime with water tables rising from 5.5 m to 10.97 m in post-monsoon period and from 1.06 to 3.35 m in summer season, respectively (Table 14). Savings & Credit habits are well imbibed with the community and as of today 79 members are involved in SHGs. They have built their core incrementally and also participate in household decision making, are given due recognition from women folk, just to quote 110 *Vaibhav* sickles are in use for farm practices and also 64 latrines, 14 soak pits, 30 smokeless *chullas* & 13 LPG connections were installed after social interventions through watershed activities. The Socio-economic changes have been tapped in the Table No.8- Change in Transportation,

Communication and Sanitation of villagers bettered to an extent that they could purchase household facilities (Motorcycles from 4 to 57, TV sets from 02 to 136 & 25 new telephone connections) because of increase in their savings due to good agricultural production. Individual hygienic habits improved).

### 3. Success stories small agro entrepreneurship in Kadwanchi Watershed:

- (a) **Group farming and marketing of pomegranate and grapes:** Improved soil and water conservation measures leads to agricultural changes. Top soil was maintained thereby increasing the soil fertility level. During the course of program the farmers were convinced by training and group discussions to adopt the concept of group farming in horticultural crops so that the water will be utilized effectively and with full potential's a result the farmers made different groups in pomegranate and grapes. At present there is 98 ha area of pomegranates covering 148

**Table 8** Change in Horticulture Crops

| Sr.No | Horticulture Crops | Previous Status (Ha) | Present Status (Ha) |
|-------|--------------------|----------------------|---------------------|
| 1     | Grapes             | 3                    | 62                  |
| 2     | Pomegranate        | Nil                  | 98                  |
| 3     | Aonla              | Nil                  | 11                  |
| 4     | Tamarind           | Nil                  | 17                  |
| 5     | Custard Apple      | Nil                  | 10                  |

(\*The Horticulture reduced the Distress - Migration in the Kadwanchi Village.)

gardens. Similarly, 200 farmers brought under grape cultivation 62 ha of area. These farmers consist of small, marginal and medium farmers. They adopt all improved package of practices for these crops as a group activity under the technical guidance of KVK scientists. Necessary trainings and interventions are being organized as per the requirement of the group. The farmers' sale their produce in the distant markets thereby fetching higher rates than the local market. KVK provides necessary guidance and assistance to the group for marketing. Due to this activity Kadwanchi village is now identified as a village famous for grapes and pomegranate. As a result, most of the government schemes related to horticulture are implemented in this village. As well as the farmers from this village have a special identity in the government offices, banks and dealers and in the market.

#### 4. Discussion

Watershed is powerful tool of socio-economic development. Natural resource generation ultimate leads to agriculture and related changes as like present case. Various watershed based studies pointed out the tangible outcomes of the projects but its very difficult to point out intangible benefits of the project. Small entrepreneurships like maintenance of the electricity pumps, thrashers to mill the various food grains, traditional small scale industries, dairy industry etc bloomed with the generation of the natural resources in the Kadwanchi village.

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