

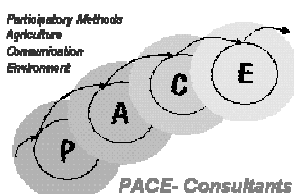
# Empowering women farmers' for promoting resilient farming systems

Sustainable pathways for better food systems in India



Final Report  
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## Abbreviations

AOFG -	Organic Farming Group in India
APEDA	Agriculture and Processed Food Products Export Development Agency
ATMA	Agricultural Technology Management Agency
C	Soil carbon
CIAT	International Centre for Tropical Agriculture
CSO	Civil Society Organization
DAP	Diammonium phosphate
F	Female
FRA	Food Rights Alliance
FSSAI	Food Safety and Standards Authority of India
GIM	Green India Mission
HYVs	High Yielding Varieties (HYVs)
ICAR	Indian Council for Agricultural Research
IFOAM	International Foundation for Organic Agriculture
IPM	Integrated Pest Management
IWMP	Integrated Watershed Management Program
KVK	Krishi Vigyan Kendra, Agricultural research and extension organisation of the state
M	Male
MASIPAG	Farmers network in the Philippines
MIDH-	Mission for Integration Development of Horticulture
MNREGA	Mahatma Gandhi National Rural Employment Guarantee Act
NCOF	National Centre of Organic Farming
n.D.	No date (for undated literature references)
NHM	National Horticultural Mission (NHM)
NMSA	National Mission for Sustainable Agriculture
NPK	Macronutrient fertilizer containing N, P2O5 and K2O
NPOF	National Project on Organic Farming
NPOP	National Programme for Organic Production
NSOP	National Standards for Organic Production
OFAI	The Organic Farming Association of India
PDS	Public Distribution System
PGS	Participatory Guarantee Systems
PIM	Participatory Impact Monitoring
PRA	Participatory Rural Appraisal
R	Gunta, local land area (1 acre = 40R)
REDD+	Reducing emissions from deforestation in developing countries
Ref.	Reference group
RKVY	Rashtriya Krishi Vikas Yojana (eng. National agricultural development programme)
SA	Sustainable Agriculture
SHFs	Smallholder Farmers
SHG	Self help group
SSP	Swayam Shikshan Prayog (eng. "self learning by doing")
SSEN	Sakhi Social Enterprise Network
GDP	Gross Domestic Product
Euro / Rs.	Average annual exchange rate for 2016 1€= 74.37 Rs,
UAV	Univariate analysis of variance
WPower	Woman Power

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## Executive Summary

**Context.** The present report is the first part of an investigation effort proposed by Misereor to study and compare sustainable food systems that have been implemented by three of its partner's organizations in India, Brazil and Senegal respectively. This study investigates outcomes at the farm holding level related with promotion of food security, women empowerment, and sustainable practices for agricultural production developed by women in the districts of Osmanabad and Tuljapur, Maharashtra. The production system under analysis is denominated "one acre model" which empowers women farmers in taking up sustainable food production systems. In the study area, just as in many areas of India, women have very little decision power in relation to agriculture. The men alone decide what is grown. The model encourages women to convince their husbands to allocate a piece of land to them. On this piece of land women farmers cultivate a variety of food crops (cereals, pulses and vegetables) and reduce cash crops (sugar cane, soy bean) both for nutritional security and better water management. In addition, a variety of practices and methods are also encouraged such as mixed cropping system for improving crop diversity, reduced use of chemicals by promoting farm yard manures, composts and of organic remedies. Management of water through promotion of micro irrigation systems such as drip and sprinklers as well as water conservation practices such as farm bunds are also supported. Some of the practices are aligned with several initiatives proposed by government towards sustainable farming practices.

**Methodology.** The research team consisted of three consultants. A senior German agronomist with the experience of previous studies and resuming the role of team leader; a senior Brazilian consultant with long standing experience in organic farming with the double role of providing technical inputs and learning the overall concept for another study to be conducted in Brazil; and a female local Indian agronomist to assist with the study of the framework conditions in India and all aspects of facilitating data processing and analysis. Eight final year students studying masters in Agri Business Management (ABM) supported the researchers in the actual fieldwork.

A detailed research concept investigating farm production, food security, nutrition, farm income and outside income and expenditure was elaborated. The research team modified an existing quantitative household questionnaire that had already proofed successful in previous studies in the Philippines and Uganda. In addition, focus group and individual in depths interviews were used. A resilience framework was added to the overall review framework.

The main field phase of the survey started in April 2016 with the training of enumerators and extensive pre-testing of the questionnaire. The interviews were finalised in a 6 week period and following analysis, the research team discussed the findings with project partner and selected farmers during an analysis workshop in August 2016.

A total sample of 400 smallholder households was selected. The sample has equal numbers (200) for each of the two study groups a) farmers outside the program (Reference group) and b) SSP farmers that are undergoing training support since 2011. Thus, most farmers in the project supported group had been supported for a period of 4-6 years. Computerized pure random sampling was used to select the SSP farmers based on available project lists. Simplified random sampling was used for the reference group. Due to the fact that the project holder promoted a 1-acre model of farming, biases due to large farm size were reduced by selecting only households with up to 3 acres of land.

## **Findings**

**House hold statistics.** The average household size in the survey was 4.8 persons, which corresponds exactly to current Indian population estimates (IIPS/India 2007). The educational level showed a rather high illiteracy level for both study groups (R: 40%; SSP 36%) and overall indicated a slightly higher attainment of educational grades (9%) for the SSP group. As SSP is working exclusively with women groups, the percentage of widowed female headed households was higher (SSP 10%, R: 6 %;). Overall, household parameters could be rated as similar for both study groups.

**Rainfall.** Long term analysis of precipitations for the study region showed that Osmanabad has been affected by one of the most severe droughts in a 75 years period (1940-2015). The last two years were severe droughts, with rainfall decreasing to 457mm in 2014 and 359mm in 2015, both years 33-48% below the historic overall average of 666mm rainfall. Further aggravating is the fact that the 2014-15 droughts were the first event with 2 consecutive years of drought for the whole 75 year period. Consequently, the data of this study give a good example for climate change induced stresses. However, the data is not a typical reflection of a normal agricultural production year. This is an important limitation for this study.

**Land and labour.** The average farm size was 2.0 acres (0.8 ha) for both study groups. Critical is the state of soil fertility. Due to the general scarcity of land, the practice of resting land by fallowing is abandoned for all farms with less than 2 acres of land. Only the bigger farmers above 2.5 acres managed to keep half an acre of land fallow. Soils samples analysed over the project duration have indicated that the soil carbon content in the soils has declined to a range of 0.35-0.45 % for most samples. Various literature references (Bhattacharyya et. al 2004; Müller-Sämamann 1985) indicate that fertile soils should have carbon contents in the range of 0.5 to 1.2% in this geographical zone. Due to the advice to use more farm yard manure, SSP farmers could raise farm yard manure production by 12.5% compared to the reference group. The average production lies at 2.5 t/ha and this amount is adequate to keep up soil fertility. However, close to 40% of farmers in all groups do not have any livestock, and thus they do not possess any manure to maintain the soil fertility. This is a major risk factor for the long term soil fertility development in the study area.

Labour on farms did not show any major differences between the two study groups. Men spent 63% of their time on the farm and the remaining 37% on own business or employment activities. Women spent half of their time on household chores (49%), 35% on farming and 16% on business activities. The male and female youth follow a similar pattern, only their chance to find outside jobs is about 1/3 higher compared to their parents. During planting and harvesting farm families hire up to 60 man-days external labour to cope with the labour peaks in the year.

**Social change and empowerment of women.** Through various ways of professional training both in agriculture but also in entrepreneurship women could gain professional skills and acquire higher self-confidence and social status. A central role in the empowerment strategy played leadership training. 65% of SSP women farmers were trained in this field against only 22% members of the reference group. Among those women who were trained in group leadership, 25 % have taken up the role as leaders, 22% as trainers and in 10% of the cases they have taken up both trainer and leader



roles. The central pillar of SSP's work has been the creation of selfhelp groups (SHG). This is reflected in a very high training reach out. 92% of SSP adopters were trained in management of savings and 83% on credit. SSP also contributed towards creating more independence by teaching how to open bank accounts. Several Indian Institutions also work in this field and thus the level of women with bank account was already high in the reference group (84%) with SSP improving it further to 90%. Bank accounts used to be an exclusive privilege of men, and considering that a bank account is essential for all types of business and therefore it is of highest practical and symbolic value in the context of women empowerment in India.

A very distinct indicator for women empowerment is that now 83% of SSP adopters can take all the decisions pertaining to land and cultivation, while only 22% of women in the reference group enjoy this management power. Also in the field of marketing SSP adopters have gained additional influence (41%) when compared with the reference group (11%). Thus, the women trained by SSP have moved a considerable step ahead in this male dominated field.

As far as the display of self-confidence in the local community is concerned, 83% of SSP farmers felt that they do not fear to display their confidence in the local community. Ninety one percent of SSP adopters said that they are contributing higher income to their household than what they were doing before, when compared to 44% of those in the reference group. Also, 76% of SSP adopters felt that their daughters in adolescent stage are getting enough to eat when compared to only 37% of the reference group.

Owing to their improved confidence levels and knowledge on agricultural practices 78% of the women feel more respected by the community than ever.

These various indicators underline strongly that SSP's work has been very successful in enhancing women empowerment.

**Crop production.** SSP has encouraged farmers to share seed and improve the quality of own seed with the goal to increase crop productivity and increase crop diversity. Major achievements could be reached in this respect. The medians for the number of crops grown rose by one compared with reference group (Ref. 4.0; SSP 5.0). For several crops such as sorghum (+50%), soya (20%) and pigeon pea (100%) yields were considerably better than the reference group. For a selection of the 14 most frequently grown crops, the cumulative total production per farm based on the medians was 20% higher in the SSP group and attained 1153 kg per farm. This highlights the superior productivity of the sustainable agriculture system in particular considering the background of severe drought. The number of vegetable growers was tripled against the reference group ( Ref. 7%, SSP 21%). The reference group farmers rely much more on soy bean as exclusive cash crop for income generation. Cash crops such as sugar cane played only a minor role with small numbers of growers in both groups (Ref. 8%; SSP 7%). The focus group discussions with SSP farmers have shown clearly that SSP farmers value the concept of food production for the household, while reference group farmers target cash income first and then rely on the market to purchase food.

The adoption of improved farming practices was measured with a participatory self assessment tool. Several practices were highly adopted by SSP farmers with full adoption rates superior to 45% of all farmers: intercropping, germination testing, seed inoculation and own seed utilisation. Training topics that were less well adopted (full adoption below 30%) included organic pest control, farm bunding, cultivation of azolla and hydroponic fodder.

The area cultivated under the one-acre model increased from 0.4 acres in 2012 to 0.8 acres in 2015. This result is a good start for a first project phase; however, it still leaves some room to reduce the number of current non-adopters (22%) and to encourage the existing adopters to bring an even higher percentage of their land under this improved ecologic management practice.

Due to drought, the usage of chemical fertilizers was rather limited in all groups. NPK was used by 10% of farmers only, while urea was used by up to 35% of farmers. SSP's recommendation not to use chemical fertilizers has shown first results. SSP farmers have lowered their application rates compared with the reference group. About a third of all farmers use herbicides while the use of insecticides is still very widespread and reaches 84% in both groups. Alternative pest control methods are applied by 25% of SSP farmers.

Very little differences between the study groups were observed on farm machinery. 19% of SSP farmers own an oxcart and 23% a plough. Tractors are still very scarce (Ref. 2%, SSP 0%) while cow stables were more common for SSP farmers (SSP 33%, Ref. 23%).

**Livestock.** About two thirds of farmers do not rear any livestock. Despite this general trend, SSP farmers have started giving this activity more attention and thus livestock numbers are better compared with the reference group. 41% of SSP farmers keep dairy cows against 29% in the reference group. The number for oxen is also higher. Goat rearing is somewhat less common than cattle (SSP 18%; Ref. 14%). Compared to 2010, livestock numbers remained constant. A major difference was recorded in respect of milk production. Here the SSP farmers have a clear advantage and produce almost twice as much milk (1129 litres) compared to the reference group (629 litres).

**Food and nutrition security.** Unlike in Africa, where severe droughts generally lead to famines, the Indian food security situation is much better. Despite of the prevailing drought, none of the farmers reported famine problems. The market already plays a much bigger role in ensuring food security for farm families. The data indicates that SSP farmers purchased a considerable proportion of their food needs from the market (wheat 62%, pulses 40%, vegetables 56% and sorghum 26%). Nevertheless, SSP's efforts to promote a better food security via own production have shown good results. The value of home-consumed food reaches on median Rs. 30, 553 for SSP farmers, which is 67% higher compared to the reference group. For wheat, pulses and vegetables the proportion of own production is in between 9-18% better compared to the reference group. The most important staple crop is sorghum and here no differences could be observed between the two study groups. The self-sufficiency rate on sorghum still reaches three quarters of consumption needs. During the focus group discussion, SSP women indicated that they now depend much less on the public distribution system (PDS) for food. In addition SSP women strongly indicated that the quality and freshness of their food is much better and consequently the health of all family members is much improved.

Food self-sufficiency was assessed with a participatory self ranking tool and via detailed calculations comparing production figures against food needs based on standardized consumption norms issued by the National Institute of Nutrition. The self-sufficiency rating based on the households self-ranking confirmed the above mentioned 9-18% production advantage of SSP farmers for all months of the year. The detailed computations taking into consideration recommendations of National Institute of

Nutrition, however, show a strong influence of the wealth of the household on food consumption. The poorer household have a very high deficit; average households have a moderate to high deficit while the better-off households are characterized by a strong oversupply of food. For an average household in the SSP group the food deficit reached the following levels: cereals -29%, pulses -40%, milk -63% and vegetables -18%. For reference group farmers the deficits were in between 5-23% higher. The consumption levels in the poorer households were unrealistically low (e.g. total cereal consumption of only 55kg against a need of 149kg) and thus, it appears likely that the poorer respondents tried to overstate their problem by not providing correct information on their true production situation.

The qualitative interviews with SSP women showed that due the trainings the dishes consumed have become more diverse with fresher ingredients. The kitchen gardens play the key role for more freshness. Equally noteworthy is that young girls and women are fed better. Several trends have led to this improvement. On the one hand side the SSP training has helped women to establish new eating habits with equal rights for both sexes in the family. On the other hand, women mentioned the positive changes brought about by the new gender roles demonstrated in films shown on television. Another more recent trend is the consumption of more snack food that may be consumed at any time of the day. Women mentioned that as the consumption of this type of foods is getting more accepted now, this is helping in particular women to catch up with their food requirements.

On health, 92% of SSP adopters confirmed that the health situation in the family improved, whereas only 32% of the respondents in reference group said so. Practically all women in the SSP group (97%) have taken haemoglobin tests repeatedly while this is only the case for half of the women in the reference group (50%).

**Income.** SSP has achieved to improve SSP farmers' incomes considerably. Farm income (Rs. 47,400) is more than three quarters higher (79%) than in the reference group. also the value of home-consumed food is 67% higher compared to the reference group. The major source of income, for both groups, however, is off-farm income; and here the income level is practically identical for both groups reaching Rs.80, 000. Thus, computing total gross income including the value of home-consumed food (Rs. 172,200), the advantage of SSP farmers stands at 27%. These findings are highly statistically significant (p. 0.003). It is important to note that income shows the typical strong variation ranging from Rs. 72,000 for a poor household (P10) to Rs. 423,000 for a better-off household (P90).

The food security focused strategy of SSP resulted in an above average income gain (+40%) in particular for the poor households (P10) compared with the reference group. This advantage on total income level is achieved through a farm income that is five times higher compared to the reference group. Thus, SSP has achieved to revitalise the farm income of rural households. While farm income of reference farmers only account for 36% of total income, it attains 49% for SSP farmers.

The upper income groups derive their income from several different sources, including small businesses, employment and remittances. The poorer farmers, however, exclusively rely on casual labour as sole off-farm income source. This makes the poor households more vulnerable to climate change. In drought years, casual labour opportunities decline strongly and thus poor households suffer double in difficult years, as both agricultural income and off-farm income sources shrink simultaneously.

Household expenditure did not show any major differences in spending pattern for both groups. Due to the drought, the annual balance of all cash income against all expenditures, showed a negative balance at median (Rs. -19.800) for the reference group, while SSP farmers had a slightly positive balance (Rs. +16.800). The lower half of households in the reference group has a very severely negative balance (Rs. -80.00 to -170.000). The respective negative balances for the lower half of SSP farmers were about 1/3 smaller. These findings demonstrated that drought years lead to a severe debt burden in particular for the poorer half of all households. Rating the income trend over a five year period, 34% of SSP farmers and 45% of reference farmers stated that their debt problem is getting worse. This finding is certainly alarming and highlights the serious income risks due to climate change in particular for the already poorer households.

The analysis of total income per capita showed that the farmers in the study region also belong to the poorest on the global scale; on median SSP households earned US \$ 1.65 per day against US \$ 1.31 for reference group farmers. The current world poverty line stands at US \$ 1.90 (World Bank 2015). Only the upper quarter of farmers exceed the current poverty line. With a daily income of just 74 US cents per head (P10) the poorest remain very far below poverty line. In this difficult context, it must be seen as an excellent achievement that SSP managed to raise in particular the income of the poorer household above average (+ 40%).

Consequently, SSP's strategy with its focus on food security can be praised as inherently pro poor. Thus, the work of SSP can be also seen as a good example that Misereor's rural development strategy is highly relevant for the needs of the poor; it helps to raise incomes in particular for the poorest of the poor, aims towards risk reduction and diversification while raising production gently and sustainably, achieving better health and environmental benefits as simultaneous synergetic outcomes.

**Resilience.** In order to compare both production systems in terms of their resilience against outside shocks, a framework of the Stockholm Centre for Resilience with 7 principles was used. For all of the seven principles for resilience applied here, the SSP group clearly performed better than the reference group. SSP has achieved very strong effects towards promoting more resilience, through the principles (2, 6 and 7) targeting 'participation', 'connectivity' and 'polycentric governance'. By connection farmer groups to government services in agriculture and health, the programme could create additional synergies and advance towards more democratic and polycentric governance structures. Also regarding the principles (4 and 5) 'systems thinking' and 'learning' very clear resilience effects could be identified. On the principle 'diversity' the programme has achieved mixed results. The progress towards more diversity of groups and organisations is good while the progress on biodiversity of plants and species is still moderate only. This will still require additional extension efforts.

**Conclusions.** Women are the focal point of SSP's work. This approach has shown good benefits and it should be continued. It is a very good strategy to let women take a leadership role on the subjects of nutrition, health, entrepreneurship and agriculture. In order to strengthen the groups further, it is essential that the groups formulate their own goals and targets and that they take up more service functions for their members.

The measures promoted under the one acre model can be rated as successful. Even in severe drought conditions, food security for the family and food sales were well superior

to the reference group. This is a good achievement and it shows the SSP has acquired good experiences in the long period of work in the area.

In order to improve the sustainable agriculture practices further, SSP can improve on the mix of key messages diffused. Animal husbandry can be enhanced by promoting goats to assist in particular poor farmers with zero grazing fodder systems. This can help farmers to produce more own manure that in turn can assist the field crops. The construction of improved animal sheds including urine storage tanks is equally recommended.

The cropping system can be improved by a better integration of agroforestry with fruit trees and fodder/green manure trees and more biodiversity training with focus on seed variety exchange.

More attention should be given on water as scarce resource. Water saving drip irrigation systems can be promoted alongside with helping farmer groups to take measures to upgrade the whole watershed by linking in additional partners experienced in watershed development.

SSP can improve the quality of its extension work by taking up result oriented M&E instruments for its organisation and by introducing participatory impact monitoring (PIM) as self-help tools to enhance group performance.

SSP and Misereor can use the results of the study for their lobbying work. The good results call for seeking more Government support for funding sustainable agriculture focused programmes. The strength of SSP's approach is that it creates good synergies between available Government services and NGO activities. Such collaborations should be expanded. Additional lobbying work is needed for promoting agroforestry on a broader scale. In times of accelerating climate change, rebuilding tree cover is of utmost importance and it should be attempted to direct also more international financial resources to climate change adaption measures.

# 1 Introduction

## 1.1 Background of this study

Many countries of the South follow the example of the development concepts of industrialised nations with the intent of catching up on their development. In such approaches, economic growth is frequently seen as a guarantee of growing prosperity for the entire population and is equated with a reduction in poverty and hunger. As a rule, agricultural policies in the South are dominated by development models that promote rapid industrialisation (large commercial corporations, plantations using mechanised working methods) and export orientation in agriculture, and almost exclusively benefit those companies with sufficient capital to meet the high investment costs required. Small-scale farmers and tenant smallholders are not only excluded from this development, but are also forced into a competitive situation that threatens their very existence. Due to high production costs, they cannot compete with the prices of the large companies, and often lose access to their land as a result of the land hunger of these companies. As 'redundant' rural workers, often unskilled, and with little education, they can find very little employment in other sectors<sup>1</sup>.

Through its own development projects, Misereor supports sustainable agriculture concepts that focus on different modes of agricultural intensification. With commissioning this study, Misereor wants to portray strategies which contribute to the establishment of sustainable food systems and contrasts these with farmers using conventional farming practices. To get a deeper understanding about them, Misereor has commissioned three studies to review the effects of three project partners in India, Senegal and Brazil. The current study is the first study of this trilogy and is about the work of the organisation Swayam Shikshan Prayog (SSP) in India.

*The study aims to show how the approaches of the project influence the food systems of the people benefitting from the project's interventions.*

A key question is whether and how the project's approaches influence the sustainability of the nutrition and economic situation of the affected families.

In the context of *sustainable food systems* it is Misereor's understanding that 'sustainable' means that the mode of production protects natural resources and ideally increases the resilience to climate change of farmers' *livelihood systems*. According to Misereor the term '*livelihood system*' extends beyond the meaning of 'production system'. A 'production system' refers to own production and thus to a combination of different modes of production (for example, arable farming combined with small livestock production). In Misereor's understanding 'Livelihood systems'<sup>2</sup> encompass a holistic view of all means of securing existence. For example, a farmer may combine arable production on his/her own plot and wild fruit collection with the processing and marketing of goods produced by him/her as well as with wage labour. Production should be economically viable – in the long term, it should also become independent of development project funding. Moreover, production should be undertaken in a manner, which is not injurious to the interests of disadvantaged groups.

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<sup>1</sup> Misereor (2008): Small-scale sustainable agriculture — a strategy for food security and sustainable development. Misereor position paper.

<sup>2</sup> Misereor (2016): Sustainable food systems - an empirical study of examples of the work of MISEREOR's partners in the global south. Terms of reference.

The planned study is to address improved forms of food production – as developed together with the beneficiaries – and their particular contribution to specific livelihood systems. This is to take account of the fact that several different pillars generally determine food security. Agricultural production can be targeted at self-sufficiency (either directly through food consumption, or through the use of monetary income from cash crops for food needs for the family) or at supplying the markets. Misereor favours a good mix of livelihood sources, with a high degree of satisfaction of family food needs prior to marketing of food production for cash purposes.

It is hoped that the study can provide answers to which extend three projects studied demonstrate good examples for sustainable food systems with secured livelihood that address the widespread problems of hunger and poverty. The comparison of the project partners work with unsupported households that follow conventional livelihood strategies is hoped to derive lessons for theory and practice to be of use in the design of ongoing and new development projects.

The main tool of the study is a detailed quantitative household survey that is complemented by qualitative interviews and literature studies.

The study investigates the following fields:

1. Outcomes at the level of the farm holding
2. Food security
3. Social implications
4. Dissemination systems
5. Theoretical model considerations
6. Framework conditions and political context

The detailed terms of reference of this study are attached in appendix 6.

## 1.2 Methodology of the survey

This study has a primary empirical base with a quantitative household questionnaire that is complemented by some qualitative interviews. The methodology relies on experiences gained during earlier empirical studies conducted in the Philippines in 2008<sup>3</sup> and in Uganda 2015<sup>4</sup>. The key elements of the methodology are described in the next sections.

### Research team

The research team consisted of three consultants. A senior German agronomist with the experience of previous studies and resuming the role of team leader; a senior Brazilian consultant with long standing experience in organic farming with the double role of providing technical inputs and learning the overall concept for another study to be conducted in Brazil; and a female local Indian agronomist to assist with the study of the framework conditions in India and all aspects of facilitating data processing and analysis. Eight final year students studying masters in Agri Business Management (ABM) supported the researchers in the actual fieldwork. Six students carried out the interviews while two students entered the data.

### Survey preparation

The preparatory talks on the outline of the study started in the last quarter of 2015 and were refined during a field mission in February 2016 between Misereor staff and the project holder SSP. The main survey preparation started with a detailed review of available project documents and a one-day workshop at Misereor's office in Aachen, Germany to discuss the anticipated impacts of the programme. These anticipated areas of impact were used as key research topics for the study. A first draft questionnaire was developed and field-tested by SSP in March 2016. The international consultants met one week prior to the field start in India for further preparations. In this period the household questionnaire was refined further and a detailed research design including qualitative research tools was developed.

**Figure 1: Osmanabad region and location within India**



### Study region and sampling

The study region is Osmanabad District located in the centre of the state of Maharashtra (see Figure 1). The area is about 400km west of Mumbai and therefore rather centrally

<sup>3</sup> The study "Food security and farmer empowerment" can be downloaded here: <http://masipag.org/downloads/>

<sup>4</sup> The study "Sustainable Agriculture - Key to Inclusive Rural Transformation" is available here: <https://www.misereor.org/publications/>



located on a north south axis in India. The zone is semi-arid with an average rainfall of about 660mm and an altitude of about 600m. The area is very rural and the distance to the next major city Pune is 300km. The population density in the study area (220) is only about half of the national average (370) and this also underlines the rural character of the setting.

The comparison of population density with the other two semi-arid regions for similar studies which will be done as mentioned above in Senegal and Brazil (101, 91) shows, that India has a much bigger population resulting in the double population density. This will be an important reference point in the overall comparison of studies.

**Table 1: Districts and population overview**

<b>State</b>	<b>Population</b>	<b>Area (Km<sup>2</sup>)</b>	<b>Population density pers./ Km<sup>2</sup></b>
India	1,276,267,000	3,287,263	388
Maharashtra state	112,372,972	307,713	370
Osmanabad District	1,660,311	7,569	220
Fatick, Senegal	267,756	2 646	101
Pernambuco; Brazil	8,931,028	98,312	91

Source: Wikipedia 2016

The sampling design was done in consultation with the Prof. H.P. Piepho, the head of the statistical department of Hohenheim University, Germany. The study has a symmetric design with two study groups SSP farmers (200) and reference farmers (200). A total sample of 400 cases can be rated as medium sized and normally already permits an advanced level of accuracy for studies<sup>5</sup>.

The sample selection for project-supported farmers (SSP) was based on available project lists of farmers. Simple random sampling was applied using the Excel statistical random number function to select farmers. An ad hoc random procedure was used for the selection of reference group farmers. SSP project staff in collaboration with the village administration and local SSP farmers selected the farmers. Three criteria were used to select reference farmers. In order to minimise any location specific effects, for each SSP farmer selected via the project files, a farmer in the direct vicinity (at least in the same village was selected). As second criteria SSP farmers and village authorities were asked to help selecting a farmer that is not part of the SSP supported groups. Based on farmers' or the authorities suggestions every third proposed household was selected. To obtain a good picture on small-scale farmers, a third selection criterion specified the farm size and only farmers 3 acres or less were sampled. This cut off point was applied to ensure a more homogeneous sample.

### **Study implementation**

The study implementation began with a one-day reconnaissance visit to a first village and a discussion of the research design and questionnaire with the project partner SSP. Then, over a period of 7 days the household questionnaire was pre-tested carefully. A total of 28 farmers were interviewed during the pre-test phase. Considerable modifications were made to the questionnaire so that the pretested data could not be used for the final study. Six students collected the main field data over a period of 4 weeks. After the pre-testing

<sup>5</sup> The total sample is smaller than previous studies conducted in the Philippines (n=840) and Uganda (n=714). Due to cost considerations this reduced sample size was retained.

the consultants focused on further qualitative interviews to gain broader insights into the research topics.

**Qualitative research methods**

In the beginning and at the end of the fieldwork, the consultant interacted with the local branch of Government agricultural extension service (KVK) in Tuljapur to review some strength and weaknesses of the collaboration of SSP with KVK and collect secondary data on the agriculture in the district. In addition to the formal household questionnaire the consultants carried out a number of focus group discussions and some in depths interviews with individual farmers. Field and village walks were taken up to gain a visual impression of village life and the agriculture in the field. Due to period of the study in the hot summer season, only a few irrigated crops could be observed in the field and the acute water shortage was visible in several villages where people were waiting in long queues just to obtain drinking water.

**Table 2: Number of farmers reached via quantitative and qualitative methods**

Method	Quantitative		Qualitative	
	Reference	SSP	No. of groups / individuals	Persons reached
Household interviews	200	200		
Group interviews (FGD)			3	33
In depths individual farmer interviews				8
Focus group discussions			5	42
Qualitative interviews			10	10
KVK talks				5

N.B.: In some cases the same person has participated in the quantitative and qualitative interview.

**Household definition**

For easy comparison with other studies, the researchers used a very simple household definition that was already used for the previous studies. The definition is as follows: *"A group of persons who normally live and eat together."* (Population and Housing Census, 2014)

**Overall research design and household questionnaire**

Building on the draft impact hypothesis generated during the first workshop held in Aachen, the researchers compiled a research design that links the main research topics that were developed already during the earlier studies done in Uganda and the Philippines with a concept on resilience that was tested earlier in various studies in Brazil. The research topics provide the main structure for the study are broken down further into a list of research questions that are grouped around areas where major impacts of the project work are expected. These impacts are identified on the level of activities, outputs, outcomes and ultimately lead into higher level impacts. The following Figure highlights the structure and flow of these impact hypotheses in a graphical form.

## **Figure 2: Flow of impact hypothesis**

The main research topics can be found in the final household questionnaire and are identical with the structuring heading lines shown with green shading (see Appendix 2). The flow of anticipated impacts is translated in a long list of questions. Most questions were integrated into the household questionnaire, while in particular the questions that focus more on "understanding" cause effect relationships were integrated into the qualitative interview tools. The overall research concept including the quantitative and qualitative tools is attached in appendix 3.

Considering the complex nature of farming and bearing in mind that this plays a pivotal role in sustainable agriculture, the researchers added a framework of resilience principles as a second line of thought for reviewing the impacts generated by the project. This analysis is presented in a separate chapter at the end.

### **Data entry and data analysis**

Two students entered the data of the household questionnaires into the computer using the software package GrafStat (version 4.68). This package allows quick checks to minimise data entry errors and provides fast data analysis. Then the data was exported to SPSS (version 20.0) for broader analysis. Some key variables were further more tested to determine statistical significance levels using the general linear model for univariate analysis of variance (UAV) tests. Tested data is marked as follows:

- \* significant differences
- \*\* highly significant differences,
- \*\*\* very highly significant difference, and
- ns for not significant.

The data was tested with the common error margin of  $\alpha = 5\%$ . The exact UAV values calculated are given under the result data tables. The significance p-values are shown for the comparison of reference group against SA group (R/SA) and for the difference between the SA group and outgrowers (SA/OG) separately.

## **Figure 3: The research team during the pre-testing training in Osmanabad**



### **Limitations of the study**

Questions related to income and expenditure forms a central part of the questionnaire. Income related questions always represent a sensitive issue for respondents. Therefore the research team placed great emphasis on a good introduction to farmers to explain the purpose of the study. Furthermore, this section of sensitive questions was asked towards the end of the survey, when the interviewers and household respondents had built a good level of trust by going through the various household and farming related topics.

Despite this precaution, the research team members noticed a number of difficulties during the interviews. Due to the severe drought the State and Central Governments had sent survey teams to assess the ground level scenario by interacting with the people. These teams went door to door for collecting information, which was a similar approach to this study. Consequently, some respondents were eager to prove that they belonged to the poorest sections of the community and the research team felt that some information provided appeared to be unduly biased towards low income and very low levels of food production and consumption. It is felt that this resulted in some level of overstatement of expenditure and cases of presumed understatement of income were experienced. In some contexts farmers were reluctant to provide information about their incomes because of different reasons. Payment of taxes, privacy, and fear to lose social benefits are some of the reasons pointed by farmers to avoid informing their incomes. It also seems plausible that farmers were expecting more project benefits if their income appears as lower. Less sensitive information such as production figures on harvested amounts were generally provided very frankly and thus appeared trust worthier.

In order to avoid biases, the team encouraged respondents to compare overall income and expenditure at the end of the interview with the goal of correcting the income estimates. With the help of this procedure a good level of corrections of the data could be achieved. It also helped to update the information on savings and other larger investment sums that occurred for buying land or other investments (e.g. motorbike, house renovations). At the

end of the interview a copy of the main income statement was handed out to the respondents to memorize this "income learning and estimation" exercise; a gesture that was greatly appreciated by farmers.

A further limitations lies in the fact that the two international researchers were residents of other countries and hence foreigners in terms of culture and language of India. Interpreting the body language of respondents and their silence when posed with certain questions were difficult to interpret for the researchers. A translator was present during each and every discussion followed by a debriefing session at the end of the day. However, in certain interviews, as staff of the organization were also present to facilitate the discussions, it was difficult for the respondents to fully open up and frankly discuss certain issues, in particular topics related to the nature of the support provided through the programme.

Good training of the students in interviewing techniques should have ensured a high level of quality of the study. Discussions with the local researchers indicated that income related biases in studies are rather common for studies in India. Considering that the Indian study is part of a set of studies including Senegal and Brazil, this limitation should be kept in mind for the comparisons made across all three countries.

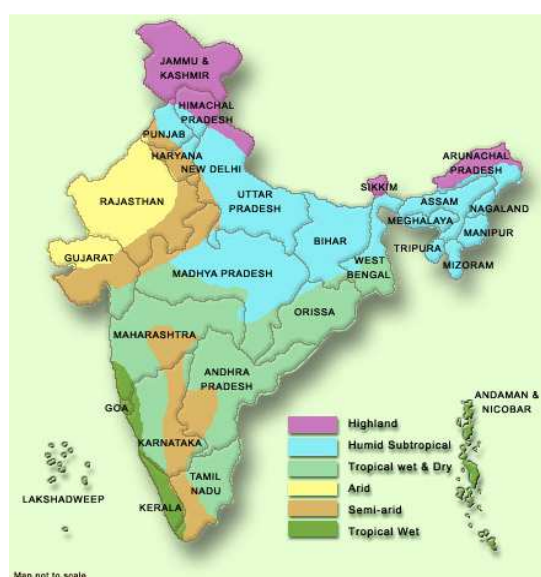
## 2 Contextual setting

### 2.1 Key developments in Indian Agriculture

Agriculture is the most important occupation of the Indian population with 58% of the population dependent on agriculture and allied sectors. The total geographical land of India is 3.3 million square km<sup>6</sup>, out of which 55% is cultivable land. Net sown area of the country in year 2012-13 was 77% of the total cultivable land, 40% of which has been sown twice<sup>7</sup>. According to NABARD, (Research 2014) the average Indian farm size stands at 2.9 acres (1.16ha). The state of Maharashtra, with 13.7 million land holdings and 19.8 million ha land stands third in the country, in terms of number of land holdings and second in terms of area.

As depicted in Figure 4, India has different climatic regions such as humid sub tropical, tropical wet and dry, arid, semi-arid etc. Owing to such varied climate, a variety of crops are grown in the country. Rice, wheat, sorghum, pearl millet, maize, millets, pigeon pea, groundnut, castor, rapeseed, sugar cane, cotton, jute are the most important crops grown in the country. During this decade, India has introduced commercial cultivation of several new crops such as dates, dragon fruit, aloe vera, jatropa etc. According to the Food and Agricultural Organisation (FAO), India is the first largest producer of millets, rice, pulses, ginger, safflower, okra, banana, mango, papaya, lemon guava, jack fruit, pomegranate, chilli pepper, fennel etc. Also, the country occupies second and third positions in the world in the cultivation of wheat, onion, cabbage, cauliflower, tea, cashew, black pepper, cotton, and jute. Agriculture contributes 16% towards Gross Domestic Product (GDP) of the country.

**Figure 4: Climatic regions in India**



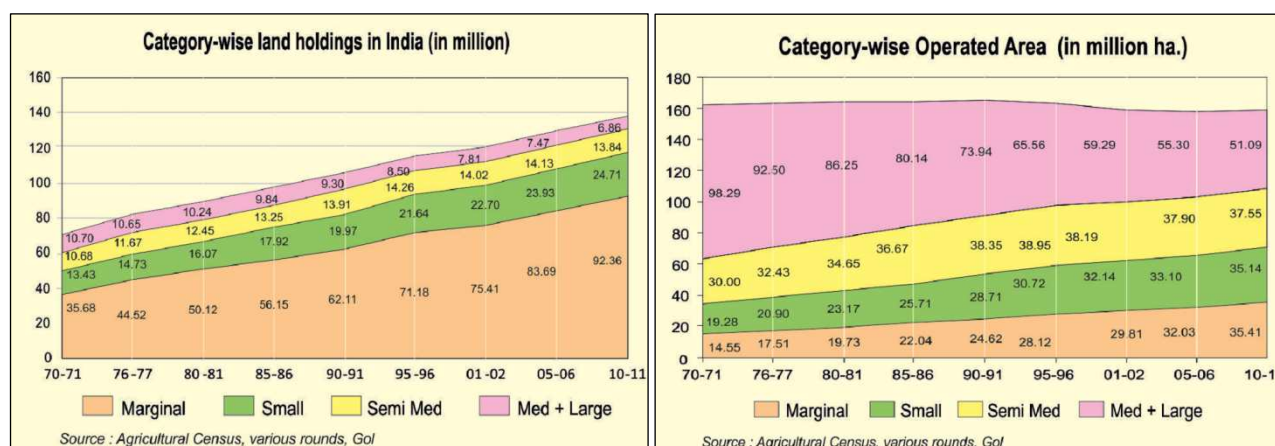
**Farm holdings:** Since independence the number of farm households has increased steadily from about 70 to 140 million. The share of marginal farmers with less than 1 ha has increased from then half to more than three quarters of all farmers today. The share of Indian farmland that is cultivated by medium to big farms (> 2ha) has declined from about 78% to 56%. The trend in Indian agriculture is completely opposite to the trend of the industrialised countries in the North. While an ever-smaller number of increasingly bigger farmers are producing the food in the North, in India, the small farmers are growing in importance steadily and play a more important role in feeding the nation. NABARD (Research 2014) analyses this trend as potentially dangerous. In their analysis the bank fears that smaller farmers will not be able to invest into machinery and modernize agriculture and therefore NABARD asks for creating stronger farmer unions that share investment resources.

<sup>6</sup> To illustrate the size of the country, India is 9.2 times larger than Germany. Compared to the continent of Africa, however, India would also fit 9 times of its surface.

<sup>7</sup> Statistical year book India, 2016, Ministry of Statistics and Programme Implementation.

The research team would not fully agree on the issue of investment but share the view that it is important to organize farmers into groups or to make them join cooperative structures that help them to find advice easier or gain better access to inputs or services. This is exactly what Misereor partners such as SSP generally do. Organize farmers and improve their access to advice and inputs of various kinds. The fact that farm size is getting smaller is certainly a challenge to the farming sector if looked at in the conventional way of promoting mechanisation. A smaller farmer is less likely to invest into machinery. But smaller farms could also be seen as an opportunity. First, it helps India to generate rural employment. Second, as will be shown in the chapter on income, farmers dispose of more off-farm income and this can be at least partly invested in agriculture. Lastly, a development path that is directed towards ecological farming practices including agroforestry that can absorb labour force would be an important opportunity for a growing population. This could contribute to stabilize the rural areas and help to reduce some of the rural urban migration. This shows that there are important trade-offs for a policy of sustainable intensification. Rather than mechanisation investment should flow into green manures, trees, improved fodder grasses, sound stables for proper management of manure and urine, soil and water conservation measures that enhance production in a sustainable way without creating losses of agricultural jobs. The point will be taken up further in the resilience and discussion chapters.

**Figure 5: Farm size trends in India since the 1970 to today (zit. in NABARD 2014)**



Legend: Marginal < 1ha, Small 1-2ha, Semi medium 2-4 ha, Medium 4-10 ha, Large >10ha

### The role of women in Indian agriculture

In India, more than 75.4% of all women workforce are engaged in agriculture (Sengupta 2009). They take up menial and labour intensive roles such as sowing, weeding, harvesting, cleaning etc. Most of the time they work as unpaid agricultural labourers in their own farm. In addition to their engagement in agriculture, they are also involved in domestic activities such as cooking, cleaning, washing, nurturing children and other related responsibilities. Women farmers are not allowed to take decisions pertaining to crop planning, agricultural practices to adopt and marketing of agricultural produce, which happen to be the key decisions in agriculture. Though lesser education than their spouses, limited external exposure and lower confidence levels are reasons attributed for the state of affairs, lack of farm assets in the name of women is one of the most important reasons for the same. The limited increase of percentage share of female operational holders from 11.7% in 2005-06 to 12.8% (Agricultural census division 2010-11) in 2010-11 with corresponding change in operated area from 9.3% to 10.3% underlines the gravity of the problem. Similarly, ownership of agricultural land does not necessarily

provide access to the asset as in many cases lands have been registered in the name of women for accessing several subsidies and schemes announced by the Government from time to time. Banks do not issue agricultural loans to women farmers, as agricultural land titles are not in their names. Quoting lesser physical strength of a woman when compared to men, women are paid only 68% to 70% of men's wages (Sengupta 2009) in the agricultural sector.

### Forests

Agroforestry provides the essential biomass for sustainable farming in addition to other benefits such as erosion control or moisture retention. As envisaged by national forest policy of 1988, agroforestry is perhaps the only alternative to meeting the target of increasing forest or tree cover all over the country. India has become the first nation in the world to adopt an agroforestry policy, which deals with the practice of integrating trees, crops and livestock on the same plot of land. The policy, approved by the Indian Cabinet in February 2014, deals with the key problems the agroforestry sector is facing at present: adverse policies, weak markets and a dearth of finance. The new policy acknowledges the fact that land-holding size is shrinking, and thus, tree farming combined with agriculture is seen as the only way forward to optimize the farm productivity and in turn, enhance livelihood opportunities of small farmers, landless and the women. The policy outlines that trees on farm or agroforestry are uniquely place for achieving multiple objectives, especially food, nutrition, employment, health and environmental security. The policy further states that Agroforestry can become an important tool to build resilience of farmers and rural people against threats of climate change and natural calamities. This can also help in greening the rural employment and rural development opportunities by providing agroforestry tree produce based economic opportunities.

**Table 3: Forests in India**

Class	Area (Sq. Km)	% of geographical area
<b>Forest cover</b>		
Very dense forest	85,904	2.6
Moderate dense forest	315,374	9.6
Open forest	300,395	9.1
Total forest cover	701,673	21.3
<b>Tree cover</b>	92,572	2.8
<b>Total forest and tree cover</b>	<b>794,245</b>	<b>24.2</b>

Source: Ministry of Environment and Forests (2015) - state of forest report 2015

The current area under agro forestry (in India is estimated to be 25.3 million ha, or 8.2% of the total geographical area of the country (Dhyani 2014). The state of Maharashtra is among the top ranking states in terms of area under agro forestry (India 2015). Overall, the forest area has increased by 13.7% when compared to the area in the year 2000-01. However, in the state of Maharashtra, the area under forests declined slightly in the same reference period (Directorate of Economics and Statistics 2013-14).

### Growth in Agriculture after independence

India became independent from the rule of the British in the year 1947. However, the newly formed government had a host of problems to tackle including low production of food grains, which was around 50 million tons. Taking into consideration Indian population which was around 360 millions, per capita production was as low as 390 grams per day. The country faced frequent famines from 1940s to 1970s leading to



starvation and malnutrition for many Indians. India was largely dependent on the US for importing wheat immediately after independence.

**Table 4: Historic food production trends in India**

Year	Food production (million tons)	Population	Production per capita (grams/day)
1950-51	50.8	361,088,000	390
1960-61	82	439,235,000	518
1970-71	108.4	548,160,000	549
1980-81	129.6	683,329,000	526
1990-91	176.4	846,387,888	578
2000-01	196.8	1,028,737,436	531
2010-11	257	1,210,726,932	589

Source: Directorate of Economics and Statistics 2010-11

During 1950s, 5% of the total food grains in the country were imported, which increased to nearly 7% during 1960s due to severe drought (I.P. Abrol n.d.)

Indian government felt a strong need to become self-sufficient in terms of food grains as foreign reserves were depleting and the country was increasingly dependent on other countries for food grains, threatening its independence. The green revolution was initiated in the year 1966<sup>8</sup> by importing High Yielding Wheat Varieties from Mexico along with increased use of fertilizers and irrigation facilities. In addition to import of High Yielding Varieties (HYVs), Indian Council for Agricultural Research (ICAR) came up with indigenous varieties. Dams were constructed on major rivers to store rainwater. Also, many wells were dug in order to provide much needed irrigation water to grow a second crop during the colder winter season. Thereby the dependency on the monsoon as only growing period could be reduced. Supply of agricultural credit increased and rural electrification improved along with rural roads. Most of these programmes were implemented in five states – Punjab, Haryana, Uttar Pradesh, Andhra Pradesh and Tamil Nadu. Owing to the green revolution, food production has gone up from less than 50 million tonnes in 1947 to 257 million tonnes in 2010-11.

However, the green revolution had its side effects too. Consumption of fertilizers increased from 1.5 million tonnes in 1967-68 (pre green revolution era) (I.P. Abrol n.d.) to 26.4 million tonnes during 2013-14 (Department of fertilizers n.d.). According to I.P. Abrol (n.d.) most farmers use nitrogenous and phosphate fertilizers to achieve high yields. However, due to the unbalanced supply of only NPK to the soils, deficiencies of secondary micronutrients (boron, iodine, manganese, selenium, zinc and molybdenum) have become very widespread. Due to the decline in soil carbon, leaching losses increase and most farmers now have to apply higher doses of fertilizers just to achieve the same yield levels. Thus, the green revolution burdened farmers with several after effects. The cost of cultivation increased due to over dependence on external inputs. Indiscriminate use of fertilizers and pesticides contaminated the ground water and surface water resources. The chemical residues in food grains resulted in several diseases including cancers. For example, in Malwa region (popularly called Cancer belt of India) of Punjab several cases of cancer have been reported due to excessive use of pesticides on cotton crop.<sup>9</sup> It is

<sup>8</sup>[http://in.boell.org/sites/default/files/downloads/Agricultural\\_Production\\_and\\_Food\\_Distribution\\_to\\_Vulnerable\\_Families\\_in\\_India\\_Today\(2\).pdf](http://in.boell.org/sites/default/files/downloads/Agricultural_Production_and_Food_Distribution_to_Vulnerable_Families_in_India_Today(2).pdf)

<sup>9</sup> <http://indiatoday.intoday.in/story/state-of-cancer/1/433195.html>

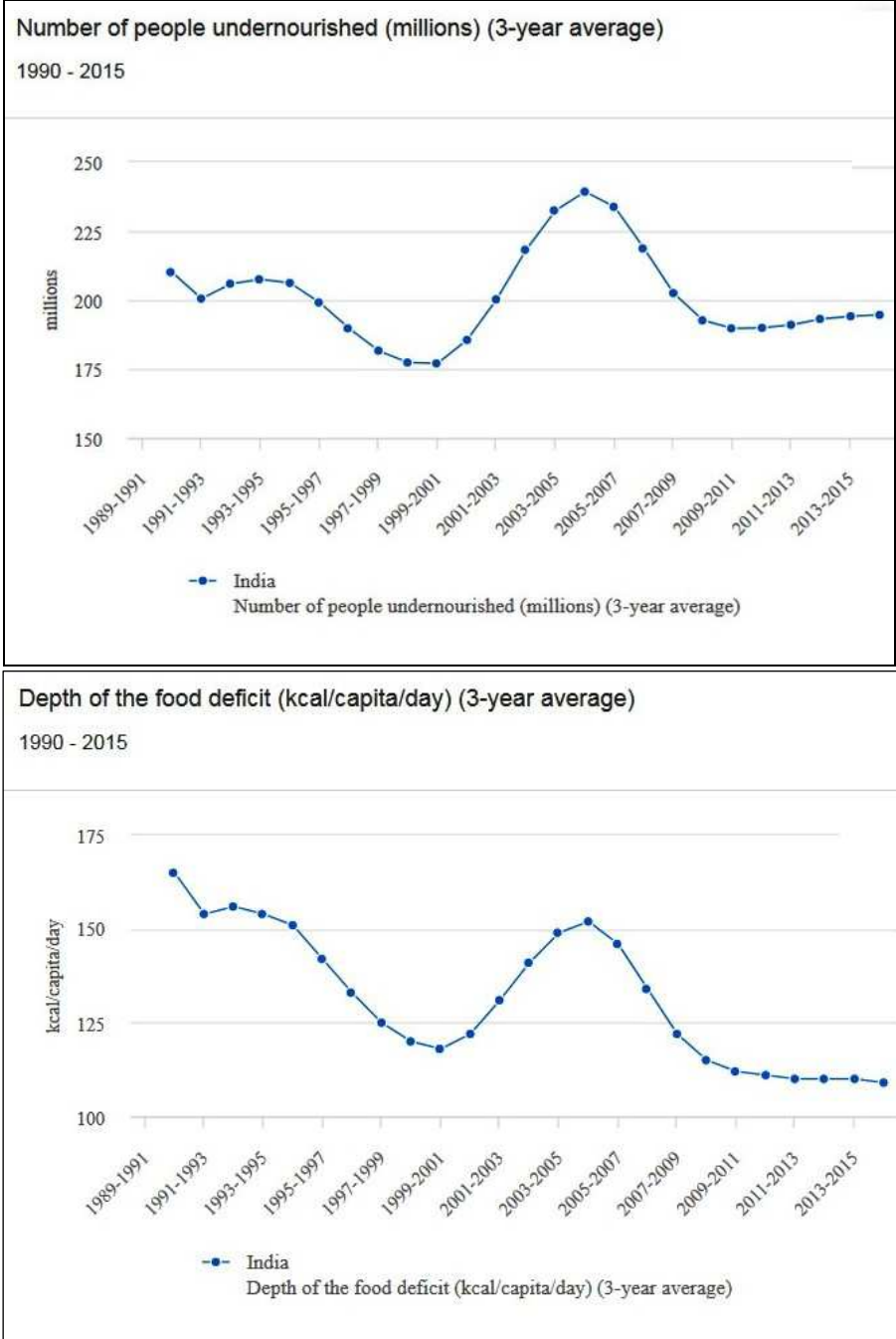
estimated that around 18 people die of Cancer in the state on a daily basis. The situation became so worse that the Government had to supply water filters to villages in order to provide drinking water free of toxins.

With respect to land, about 32% of the land in the country is undergoing various forms of degradation and 25% of the geographical area is affected by desertification (Ministry of environment and forests 2014). Although currently there is no specific policy or legislative framework for combating desertification, India is implementing a number of programs and schemes pertaining to sustainable land and ecosystem management, which include Mahatma Gandhi National Rural Employment Guarantee Act (MNREGA), Green India Mission (GIM) and Integrated Watershed Management Programs (IWMP). The report recommends best practices such as participatory climate monitoring, alternate fuels, water mills, rehabilitation of forests, agroforestry linked with watershed management, waste land development, soil and water management etc.

## 2.2 Food security

In the last chapter, it was shown that the production of basic cereals and basic food items has improved considerably since India's independence in 1948. This progress is also visible in the basic food statistics produced by statistics department of FAO (2017).

**Figure 6: Selected food security trends for India (FAO 2017)**



Source: FAO (2017): FAO country profile.

The data shows that the number of malnourished people currently stands below 200 millions. The depth of the food deficit has come down from about 170 kcal/day/capita in the early 1990ties to only about 110kcal/day/capita since 2010. A deficit of 110kcal against a daily requirement of 2500 kcal would indicate a caloric deficit of only 4.4%. This simple calculation would suggest that the food security problem in India has been

overcome. Is there something wrong with these statistics? Reality is more complex and there are several problems linked to these statistics. The major flaw is that food produced is not automatically also consumed. The better off people can afford to buy as much food as they like, but the poor segments of the population just can't afford to buy or they don't produce enough as they would need. Therefore, the FAO statistics only have a theoretical value, they certainly indicate that the magnitude of the problem could be reduced, but there are still many open challenges to food security as will be laid out further in this section.

Malnutrition, especially among women, children and adolescent girls is widely prevalent in India. The male head of the household is considered to be the most important member of the household in the Indian patriarchal society. The nutritional needs of the male head are of primary importance, followed by other adult males, male children, female children and adult females (mostly in the same order). Hence, nutritional needs of children and women in the family may be neglected, in particular if food is short.

The following nutrition related health problems are the most frequently encountered in India:

- Protein Energy Malnutrition (PEM),
- Micronutrient deficiencies such as vitamin A deficiency (VAD),
- Iron Deficiency Anaemia (IDA),
- Iodine Deficiency Disorders (IDD) and
- Vitamin B-complex deficiencies (National Institute of Nutrition 2011).

These diseases occur most commonly in rural areas and urban slums. Maternal under nutrition which includes underweight, poor weight gain during pregnancy, nutritional anaemia and vitamin deficiencies are the primary reasons for malnutrition among children.

According to Comprehensive Nutritional Study (National Institute for Nutrition 2011) conducted in Maharashtra in 2012, 23% of children below the age of two years are too short for their age (**stunting**), 16% are too thin for their height (**wasting**) and 22% are too thin for their age (**underweight**). As far as mothers are concerned, 40.7% of them have a body mass index of less than 18.5 what indicates that they are seriously underweight. Further aggravating is the fact that besides underweight, 48% of all women, or 58% of pregnant women are anaemic (International Institute of Population Sciences 2012). If we look at the children in the age group 2-5 years the situation is even more severe, 63% of children lack iron and surprisingly, boys are more likely to be anaemic than girls (International Institute of Population Sciences 2005-06).

However, the situation has definitely improved if compared with older data of the year 2005, when the above indicators still were recorded as 39% for stunting, 20% for wasting and 22% for underweight (International Institute of Population Sciences 2005-06).

The National Family Health Survey (NFHS) is a large-scale, multi-round survey conducted in a representative sample of households throughout India. Three rounds of the survey have been conducted since the first survey in 1992-93. The survey provides state and national information for India on fertility, infant and child mortality, the practice of family planning, maternal and child health, reproductive health, nutrition, anaemia, utilization and quality of health and family planning services. According to National Family Health

Survey -3, only 10.3% of children between 6-23 months are fed with minimum dietary diversity (fed with four food groups (grains, pulses, eggs, meat, dairy, fruits and vegetables) during the previous day. The situation is worse in urban areas; where in only 7.4% of children were fed with minimum dietary diversity. BMI or Body Mass Index is a globally acknowledged method of measuring obesity recommended by the WHO (World Health Organization). It is calculated by dividing the weight in kilograms by the square of an individual's height in meters. In case of mothers in rural area, Body Mass Index is less than 18.5% in 53% of rural areas and 63% of urban areas indicating acute nutritional issues in mothers and infants.

**Table 5: Nutritional problems of children and mothers<sup>10</sup>**

Indicator	Rural %	Urban %	Total %
Children between 6-23 months who are fed with minimum dietary diversity <sup>11</sup>	10.3	7.4	8.9
Children between 6-23 months who receive minimum acceptable diet <sup>12</sup>	8.4	5.7	7.0
Children between 6-23 months who are fed iron rich foods <sup>13</sup>	15.2	19.8	17.4
Mothers with Body Mass Index less than 18.5%	53.1	63.3	57.9

According to National Family Health Survey 3 (NFHS), conducted during 2005-2006, 33% of women and 28% of men had a Body Mass Index (BMI) less than 18.5 Kg/square meter. As provided in Table -7, 56.2% of women and 24.3% of men who are married are anaemic. Owing to lower BMIs and anaemia in pregnant women, children are facing severe growth problems. It is alarming to note that nearly 80% of the children between 6 and 35 months are anaemic leading to severe growth related problems in them. According to the National Institute of Nutrition, 22% of children in the country have registered lower birth weight when compared to only 10% of children in the developed countries.

**Table 6: Key indicators - National Family Health Survey 2005-2006 (NFHS)**

Key indicators	%
Women whose Body Mass Index is below normal	33.0
Men whose Body Mass Index is below normal	28.1
Anaemic children age 6-35 months	78.9
Anaemic ever-married women age 15-49	56.2
Anaemic pregnant women age 15-49	57.9
Anaemic ever-married men age 15-49	24.3

Nutritional security of any household is dependant various factors such as availability of food (food production and imports), awareness on nutritional requirements, taste preferences, gender bias and affordability. As was shown in the last chapter, the

<sup>10</sup> <http://rchiips.org/nfhs/factsheet.shtml> (viewed 8.5.2017)

<sup>11</sup> 6-23 month old children who were fed with four food groups (grains, pulses, eggs, meat, dairy, fruits and vegetables) given during the previous day.

<sup>12</sup> Breast fed children between 6-23 months of age have at least minimum dietary diversity and minimum meal frequency the previous day and non breast fed children between 6-23 months of age, who receive at least 2 milk feeds, had at least the minimum dietary diversity not including milk feeds and the minimum meal frequency during the previous day.

<sup>13</sup> Meat, chicken, bird, shellfish, eggs, commercially produced fortified foods given during the previous day

production of food has increased from 50.8 million tonnes to 257 million tons in 2010-2011. According to food balance sheets published by FAO (2013)<sup>14</sup>, India is self-sufficient in terms of cereals, millets and milk. The Indian population mainly consumes carbohydrates and hence self-sufficiency of the country in terms of availability as well as consumption of cereals should be given. As far as pulses and oils are concerned, 17% of total domestic requirement of pulses and 16% of oils are being imported from other countries. When it comes to milk, the average milk availability is 290 grams per day, which is 5gm more than the world average of 285 grams per day<sup>15</sup>. The open discrepancy between food availability and continued prevalence of malnutrition, has led the Indian Government to address the problem of affordability of food. Food grains are being distributed to the poor (below Poverty Level) people through the Public Distribution System (PDS) at subsidized rates. The system (PDS)<sup>16</sup> has been established by Ministry of Consumer Affairs, Food, and Public Distribution and managed jointly with state Governments in India. This scheme was launched in India on June 1997. Commodities such as wheat, rice, sugar, and kerosene are distributed through a network of fair price shops known as ration shops. Prices under PDS are formulated by respective state governments. For example, the State Government of Punjab had launched the Atta dal<sup>17</sup> (flour and lentil) scheme in the year 2007. Under this scheme, wheat was distributed at the rate of 5kg per household member (maximum of 25Kg per member) @ Rs. 4.00 per kg. In addition three varieties of lentils bengal gram, green gram and black gram are distributed @ 0.5 kg per member (maximum of 2.5 kg per family) @ Rs. 20.00 per kg. The wholesale market rates of these commodities in August 2007 were Rs.39 per Kg of black gram, Rs.34 per Kg of green gram 3,900 and Rs.14 per Kg of wheat<sup>18</sup>. Moreover, the quality of the commodities available in the ration shops is very poor when compared to those available in the mainstream markets. According to (Anjani kumar n.d.) the PDS contributed to overall reduction in poverty by 3.5 per cent points in 2011-12, with 4.2 per cent points in rural areas and 1.7 per cent points in urban areas, amounting to around 40 million people who came out of poverty. Thus, it may be concluded that PDS has contributed to reduce the overall food security problem, but more efforts are still required.

With respect to affordability of food, the country prospered economically owing to liberalisation and privatisation starting from the year 1991. However, in spite of the higher economic growth rate and despite of the fact that food has become cheaper due to the higher production volumes, food consumption has not increased suggesting that the poor and hungry may have failed to benefit adequately from overall growth (FAO, IFAD, World Food Programme n.d.).

In 2012 SSP conducted a nutrition study, to investigate the magnitude of the nutrition problem in its intervention zone in Osmanabad region. The food consumption for typical families of 5 persons is compared the food requirements recommended by the National Institute of Nutrition, Hyderabad. Consumption of pulses, eggs and non-vegetarian food, which are the main sources of protein are in line with the official recommendations. Also, consumption of visible oils is on par with the recommended consumption. However, when cereals and millets, milk, vegetables and fruits are concerned, the consumption falls far

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<sup>14</sup> <http://ref.data.fao.org/dataset-data-filter?entryId=48dc9161-53e2-4883-93c0-8f099e5e67ab&tab=data>

<sup>15</sup> <http://timesofindia.indiatimes.com/city/vadodara/Indias-per-capita-milk-availability-above-world-average/articleshow/27301696.cms>

<sup>16</sup> [https://en.wikipedia.org/wiki/Public\\_distribution\\_system](https://en.wikipedia.org/wiki/Public_distribution_system)

<sup>17</sup> <http://foodsuppb.nic.in/branches/fd.htm>

<sup>18</sup> [http://articles.economictimes.indiatimes.com/2007-08-06/news/28386422\\_1\\_urad-dal-maida-and-sooji-moong-dal](http://articles.economictimes.indiatimes.com/2007-08-06/news/28386422_1_urad-dal-maida-and-sooji-moong-dal)

below recommendations. The deficit is highest for vegetables, only as little as 5% of the required vegetables are consumed! Considering that vegetables are important sources of essential vitamins, fibres and minerals, it is evident that the lack of vegetables represents one of the major reasons for malnutrition. Similar, the deficit for fruits (47%), milk (51%) are high and even on basic staple foods such as cereals and millets the deficit reaches 38%<sup>19</sup>.

**Table 7 Recommended food intake for a family of five**

Food category	Consumption (Kg/year)		
	Recommended*	Current	Difference in %
Cereals & Millets (Kg)	832	517	-38
Pulses, eggs and non-veg food (Kg)	130	130	0
Milk (Lit)	756	372	-51
Vegetables (Kg)	2052	106	-95
Fruits (Kg)	180	95	-47
Fats and oils (visible) (Kg)	61	62	1

Source: SSP and National Institute of Nutrition (NIN), Hyderabad (2012)

A key problem related to calculate annual food rations has to do with seasonality. The consumption depends on what is available. In particular the consumption of fruits and vegetables is strongly seasonal and limited to the monsoon period mainly. A majority of carbohydrate requirement is met by cereals such as rice and wheat instead of the traditional millets.

With the availability of new foods in the markets, also food habits are changing. In Maharashtra, people traditionally consumed a variety of cereals such as wheat, rice and millets according to various seasons. In addition to wheat and rice, people would consume finger millet during summer and pearl millet during winter. Various pulses complemented the cereals: Sprouted green gram, moth bean, bengal gram was consumed along with breads made from cereals and millets. Pulses and millets provided the essential B complex and iron to them. In addition to these crops, people would cultivate and consume ground nut, flax seeds and sesame seeds which provided omega 3 fatty acids, other essential fats, tryptophan etc. that were required to ensure proper nutrition. It is to be noted that traditionally, people would not consume much fruits and vegetables. In the past, all the crops were cultivated organically and hence were toxin free.

However, gradually food crops gave way to cash crop such as soy bean and sugar cane. Owing to the Public Distribution System, consumption of rice and wheat increased. Also, gradually the taste of people changed and they were not interested to have millets that are coarser and harder to chew as compared to wheat and rice which are softer. Reduction in consumption of iron rich millets and negligible consumption of vegetables and fruits, are the main reasons that contribute to acute malnutrition even today. The problems are most severe with new-born children and may persist over a lifetime as shown by the high numbers of malnourished adults.

<sup>19</sup> It is certainly very plausible that deficits exist, however, the deficit figures calculated in studies based on household questionnaires are often somewhat exaggerated. This problem also occurred for this study as will be shown in the results chapter.

## 2.3 SSP and its support strategy for farmers

### About Swayam Shikshan Prayog

SSP is headquartered in Mumbai and it began its work in the economically backward Marathwada region of Maharashtra, which experienced a massive earthquake in 1993. Working to transform this mass-scale disaster into an opportunity for development, SSP partnered with institutions, to develop a widespread network of women. After completion of the reconstruction project in 1998, SSP was supported by HIVOS<sup>20</sup> over multiple years to form and strengthen grassroots institutions that went beyond savings and credit to build social, political and economic competencies for its women members by enhancing access to finance, markets and local institutions. In the process of disaster reconstruction, SSP started promoting savings and credit groups to provide economic and social capacity building support to women. However, groups could not leverage the volumes of credit that were actually being demanded and hence the need for a larger organizational structure came into being. Thus, the first federation was registered in Tuljapur in the year 2000. The federation is a three-tier structure comprising of a network of SHGs with the SHG at the village level, SHG representation at cluster level (10-15 villages) and the executive committee at the Taluka level with the broad objective of empowering women and providing them with livelihood options. While the groups are directly linked to the federations, the cluster is an informal network that allows groups to share information, place demand for loans, widen their contacts, and access resources in districts. Federations identify new opportunities and develop income generation programs for women. By 2005, there were a total of 2,427 SHGs promoted by SSP, which came together to form eight federations and this strategy continued leading to a total of 20 federations. SSP facilitates the growth of the network of over 5,200 Self Help Groups, which now covers over 80, 000 members going beyond micro-credit to start micro enterprises in 1,600+ villages across four states in India. The cumulative SHG savings stands at Rs 60 Millions (6 crores).

SSP has promoted entities such as Sakhi Unique Rural Enterprises (SURE) to support women in rural marketing and distribution, Sakhi Social Enterprise Network (SSEN) for developing skills and entrepreneurship, Sakhi Samudaya Kosh (SSK) for providing innovative finance and Sakhi Arogya Samudaya Trust (SAST) working towards preventive health services. Swayam Shikshan Prayog has put forth efforts towards agricultural development around five years ago. Swayam Shikshan Prayog SSP's strategy for sustainable agriculture targets women farmers in landless, marginal and small farmer households across drought-prone regions such as Vidharba and Marathwada in Maharashtra.

#### SSP's Strategy:

- SSP's has created a unique strategy by focusing on the inter linkage between agriculture, food security and nutrition. SSP aims to bring together the key stakeholders – women farmers, local government and other institutions- during different aspects of the program. Such programmatic inter-sectionality made the linkages between health, agriculture, livelihoods and natural resource management come alive for grassroots women.

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<sup>20</sup> Humanist Institute for Development Cooperation



- In line with SSP's mission, the program focuses on equipping community women to take charge of building sustainable livelihoods. The project, aims at empowering women farmers with sustainable agriculture information, enhanced skills and solutions. This in turn supports women to be recognized as farmers and leaders of the communities. At a household level, women will be more aware of the importance of nutrition, health status and adopt better practices for improved health and well-being
- SSP aims at creating sustainable impact. The progressive agriculture leaders will play a key role as community advocates and catalyze collaborations between women farmers and local government institutions to transfer basic agriculture tools prototyped in their labs in the fields through women farmers, livelihoods increase; there have never been easy bridges to bring the two together.

### **One-acre model:**

Swayam Shikshan Prayog has been working in Osmanabad district on several health projects. During the implementation of these projects, the organisation realised that rural households were unable to meet nutritional requirements of the family as they mostly take up cash crops such as sugarcane, cotton and soybean. Food crops like pulses remained too much neglected. Also, millets such as sorghum and pearl millet and vegetables such as spinach, fenugreek, okra, eggplant and coriander etc. were taken up in a very limited manner. Though households would buy cereals and some pulses from the Public Distribution System (PDS), their nutritional requirement through millets and vegetables was largely unmet as the prices of these commodities were too high in the market and hence they are not consumed as per requirement. Furthermore considering that the markets are far away from the villages, they faced difficulties not getting sufficient quantity of vegetables owing to their short shelf life. Hence, the women in SSP's groups felt that genuine support towards agricultural activities was needed. Based on the above problem analysis, the group members reasoned if women as farmers take-up a higher responsibility in well feeding their family members by engaging in growing of food crops in an acre of land using organic methods of cultivation, their cost of cultivation would reduce, they would get better quality of food and would be able to improve the health conditions in the family. SSP supported the women initiative and a project was designed to assist women farmers by organizing them into producer groups.

SSP started off with an attempt to analyse the underlying problems in close dialogue with the women groups in the region. The analysis led to the following problem description: Farmers in Osmanabad were increasingly dependent on external inputs such as seeds, fertilizers, pesticides, herbicides etc. Farmers almost forgot their traditional crop varieties, food crops, manures, natural methods of managing pests etc. and were falling prey to the gimmicks played by agricultural input providers. Cash crops replaced the food crops leading to nutritional insecurity among several households of the village. Growing single crops instead of mixed crops also increased the risk of single crop failure there by increasing cost of cultivation and risk. Over time this can turn into a debt trap for farmers. Animal husbandry has been declining over a period of time and hence the interdependence of agriculture and animal husbandry were decreasing. Women were perceived as labour as they do not own land, lack knowledge of agricultural practices, and do not go to the market to sell produce. Poor economic conditions and low purchasing power of these households results in malnutrition and poor health of women and children.

To combat this situation SSP developed the One Acre Model. The starting point of the strategy is the recognition that women as farmers are crucial to decision making in agriculture and nutrition of households. The model was introduced in order to promote nutritional security of households by empowering women farmers to take-up farm related decisions – right from crop planning to marketing of agricultural produce. Understanding that women would face difficulties in convincing their husbands to introduce change into the farming system, it was decided to start little by little. Rather than changing the entire farm in one go, the new approach should be tested on a small area of land and then gradually expanded to a larger proportion of the total farm. That's how the name "one acre model" emerged. Starting with as little as one acre and then scaling up the model. In the course of the work, however, the name also created some confusion, as some people also misunderstood the approach to be limited to only one acre of the farm. For this reason SSP now plans to rename the programme according to the true content of the work -food security farming.

SSP also designed an innovative strategy to implement this concept. The goal of the project was to increase the leadership of individual women and collectives to claim their rights and drive individual and community entitlements, leading to improved outcomes in healthcare, agriculture and food security. First, it purposively created an inter-connection between agriculture, food security, nutrition and disaster resilience into the design and delivery of all its initiatives. This ensured that all stakeholders – from the SSP team, to the rural women, to government officials- maintained the synergy and inter-dependence between these three components as they participated in, and led different aspects of the project. Such programmatic intersectionality made the linkages between health, agriculture, livelihoods and natural resource management come alive for grassroots women. Second, it embedded SSP's theory of change into its DNA – ie putting community women in charge of building sustainable livelihoods. The project, thus aimed, to create women agriculture and health leaders who would be tasked to address the challenge. The idea was to mandate community women to be the implementers, trainers and scalers of this project, thereby embedding it deep within the community. Third, it catalysed collaborations between rural women entrepreneurs and local government officials to make both stakeholders relevant to each other. While the latter have the technical acumen that the former need for survival and livelihoods increase, there have never been easy bridges to bring the two together. Taken together, the three-pronged approach together made the project innovative and pragmatic.

To achieve these objectives women were federated into farming groups and then trained on sustainable farming methodologies. As women farmers do not own the land, they took an undertaking from their husbands stating that they were free to cultivate the land on their own. Then, the following activities were promoted under the model:

- Taking up food crops in place of cash crops such as sugarcane and soybean for nutritional security.
- Starting mixed cropping system for improving the crop diversity, thereby improving the food security of farmers.
- Reduced use of chemicals by promoting the use of vermicompost, bio dynamic compost, neem based concoctions, seed inoculations and seed treatments.
- Management of water through promotion of micro irrigation systems such as drip and sprinklers in addition to construction of farm bunds and trenches.
- Convergence activities with various schemes promoted by agriculture and allied department towards sustainable farming practices.

- Reduction of cost of cultivation through establishment of own seed banks, labour exchange, production of manures and solutions for controlling pests.
- In order to reduce the risk of low seed germination, a problem often found with purchased seed, women were taught the practice of germination tests with the help of locally available materials.
- Better nutrient management by advocating the importance of soil testing and adding nutrients based on the recommendations was encouraged under the model.

Swayam Shikshan Prayog (SSP) promoted the concept of one-acre model by organising meetings of farmers on a campaign mode. Farmers who were interested in the concept were encouraged to be part of producer groups. SSP demonstrated the importance of various processes taken up under the one acre model to these producer groups. Active members of the producer groups were trained as women leaders and took up equal responsibility for disseminating the practice to other women farmers in the village. Mostly, women took up cultivation in this model for nutritional security and for providing chemical free food to their family members. In addition to the low cost sustainable agricultural practices, SSP encouraged women farmers to take up agri-allied activities such as dairy, poultry and cultivation of small ruminants.

Furthermore, activities such as vermicompost and biodynamic composting were encouraged and women were driven towards diversifying their livelihood options. Women farmers who are organised into producer groups have established seed banks. Unlike the popular concept of a physical bank where seeds are stored, women farmers harvest seeds and store these seeds with them at their homes/farms. These seeds are traded within the producer group either for money or for other seeds. Only when seeds are in short supply, members of these groups buy them from the market. Also, the practices that were advocated by SSP were not completely new to the region. The practices that were earlier followed by the farmers – retaining seeds for further sowing, adding farm yard manure to the soil, allocating land for growing crops for own consumption etc. were advocated to the farmers. Hence farmers could recollect the practices that were taken up by their fathers and fore fathers and could easily accept those practices.

With the support of SSP, the women producer groups were linked both to the Krishi Vigyan Kendra (KVK) and Agricultural Technology Management Agency (ATMA) who have been training women farmers on various suitable crops for the one acre model. In addition, several drought management practices were advocated to the women producers through these agencies. Krishi Vigyan Kendra provided team of experts to SSP to train farmers on seed treatment, irrigation systems, grain storage, smokeless chulha ovens, pest management systems with locally available material, milk production and processing techniques along with recipes for improving the haemoglobin levels of women and adolescent girls.

### 3 Basic facts on households

This chapter begins with the presentation of a living example of a female farmer supported by SSP. This case study is intended to familiarize the reader with the conditions faced by poor farmers in this dry area of India. A concrete example of a farmer in mind may make it easier to interpret the statistical data on all farmers presented later in the main chapter.

After the case study selected basic facts on households are presented. At first, household size and educational status of households are presented. Then, a long term analysis of the climate in the study region is provided. Finally, the households' access to land and the availability of labour on farms are conferred.

#### 3.1 Case study farm household

The research team interviewed three farmers according to a very detailed interview guideline and four farmers with a shorter interview guideline. It turned out a difficult choice to decide whom to present here. The team decided to present Mrs. Vanita Manshetty here. The other interviews are attached in appendices 2 and 3. Vanita is a very good case of a female farmer that shows how women can advance and learn diverse farming skills combined with entrepreneurship and group leaders capacities in a very short period of time.

#### REAPING GOOD HEALTH AND PROFITS TOO!

##### Who is Vanita?

Vanita Balbhim Manshetty is a thirty five year old lady who resides in Chiwri village in Tuljapur Taluka of Osmanabad district in of Maharashtra. She has four girl children studying graduation, 12th standard, 10th standard and seventh standard. As Vanita could study only till 8<sup>th</sup> standard owing to monetary limitations, she understands the importance of education for a girl child and hence wants all her girl children to study till post-graduation and settle down in good jobs. Vanita and her husband earn their livelihood through farming and dairy activities. Her husband Balbhim Manshetty generates off farm income through civil contracting such as laying roads, constructing water harvesting structures, land levelling, etc. Around 50% of annual income of the household comes from civil contracting and the rest comes from agriculture and dairy activities.



By cultivating crops under one acre model, I have been doing what the doctor does for people - providing good health  
Vanita Manshetty

### How did she know about the model?

Vanita was one of the participants who went for an exposure visit to a place called Siddhagiri, where in an organic farm was located. During the visit, she saw the model farm wherein more than hundred crops were grown in a single acre of land. Almost all the crops that were required to ensure nutritional security of a household were grown in the model farm. Looking at the biodiversity of model, Vanita felt that she should also grow as many crops as possible in an acre of land in an organic manner to ensure that her household is self-sufficient to the maximum extent possible.

### Reasons for taking up the model:

- By the time she went to the exposure visit, her husband had developed high blood pressure and diabetes because of which she was even more concerned about the health of her family. She took up organic farming to provide healthy food for her family members and not for selling in the market.
- She felt that the toxins in the food material purchased from outside are the prime reasons for which people are falling prey to various diseases. She said that as she has land, she would be able to grow healthy food for her family.
- Though she belongs to a farming household, she was never part of cultivation. She was keen to take up agriculture on her own and was excited at the opportunity of learning organic agriculture from scratch.
- Also, she felt that they are unaware of the inputs that are used by other growers on vegetables and other food grains that are available in the market.

### How did she start working under one acre model?

Vanita took an undertaking from her husband that she would cultivate an acre of land on her own in the year 2014. In India this is a clear sign of female empowerment, as a large percentage of women do not have land titles and hence cannot access bank loans and other facilities and services. In one acre of land, Vanita cultivated cereals, pulses and vegetables and in another two acres, she supported her husband in cultivating Soybean and grapes. This continued in 2015 as well, which happened to be a drought year, owing to which she was not willing to take any new decisions. In 2016 however, the family has taken two more acres of land on lease and a total of three acres of land has been brought under one acre model.

### Economic implication of the model (2015):

Crop	Area in acres	Total production (Kg)	Own consumption (Kg)	Own consumption	Produce marketed
Sorghum	0.5	300	300	6.000 Rs.	0 Rs.
Wheat	0.25	300	300	7.500 Rs.	0 Rs.
Pigeon pea	0.125	50	50	2.000 Rs.	
Bengal gram	0.25	100	100	4.000 Rs.	
Green gram	0.075	30	30	1.050 Rs.	
Black gram	0.1	40	40	1.600 Rs.	
Brinjal	0.25	500	25	250 Rs.	4.750 Rs.
Onion	0.75	2500	100	900 Rs.	21.600 Rs.
Chillies	0.025	50	50	1.500 Rs.	
Tomato	0.025	30		700 Rs.	
Ladies finger	0			600 Rs.	
Leafy vegetables ( 4 varieties)	0.1			1.700 Rs.	
<b>Total</b>	<b>2.45</b>	<b>3900</b>	<b>995</b>	<b>27.800 Rs.</b>	<b>26.350 Rs.</b>
<b>Euro</b>				<b>373.81 €</b>	<b>354.31 €</b>

Earlier, the Vanita's husband would only take up two to three crops in their three acre farm. During 2015, they took up a total of fifteen crops under the one acre model. All the three food categories – cereals and millets, pulses and vegetables (including leafy vegetables) were taken up.

More than 68% of the land cultivated in Kharif (rainy season) was cultivated in Rabi (winter season) as well<sup>21</sup>. Vanita reaped more than<sup>22</sup> 3900 kilograms of produce during the year 2015. Around 25% of the total production was used for household consumption. In terms of value, the amount of produce consumed fulfils 75% of the food requirement of the family. In terms of farm costs, Vanita incurred a total of 9600 Rupees excluding manure worth 6,000 Rupees in her diary farm. Hence, net income is Rs. 44,550 (€ 599.-)<sup>23</sup> for two seasons, which amounts to nearly Rs.18,000 (€ 244.-) per acre of land cultivated.

### **Social implications of the model:**

Even before joining SSP, her husband would consult her in taking decisions. However, as she did not know anything about farming, she was not confident to give proper suggestions. However, after becoming part of the producer group, her confidence improved. She is now able to take care of the farm on her own, thereby providing free time for her husband to expand his civil contracting business. Owing to the same household income has also increased. Her husband supports her in all farm related activities. Even children work on the farm and help her in cultivation. Her children are proud of the activities she takes up as an organic farmer. She says: *"I understood the importance of healthy food owing to the ill health of my husband. I have also received support from my family in this regard."* Her children respect her even more than what they did before and her eldest daughter treats her as a role model. In addition to all these, she gained respect in the community as a successful women farmer.

### **What are her future plans:**

She feels that she has been cultivating grapes using chemicals and has been selling the same in the market. Now that she is able to give good quality food to her family, she would like to offer good quality organic grapes to the market as well.

More details about Vanita's farm are given in Appendix 3.

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<sup>21</sup> Against an average of less than 18% of Kharif land being cultivated in Rabi in Maharashtra

<sup>22</sup> Including produce from leafy vegetables which is calculated in bunches and not kilograms.

<sup>23</sup> Average annual exchange rate for 2016 of Rs to 1 Euro = 74.37Rs (www.fxtop.com)

### 3.2 Composition of households

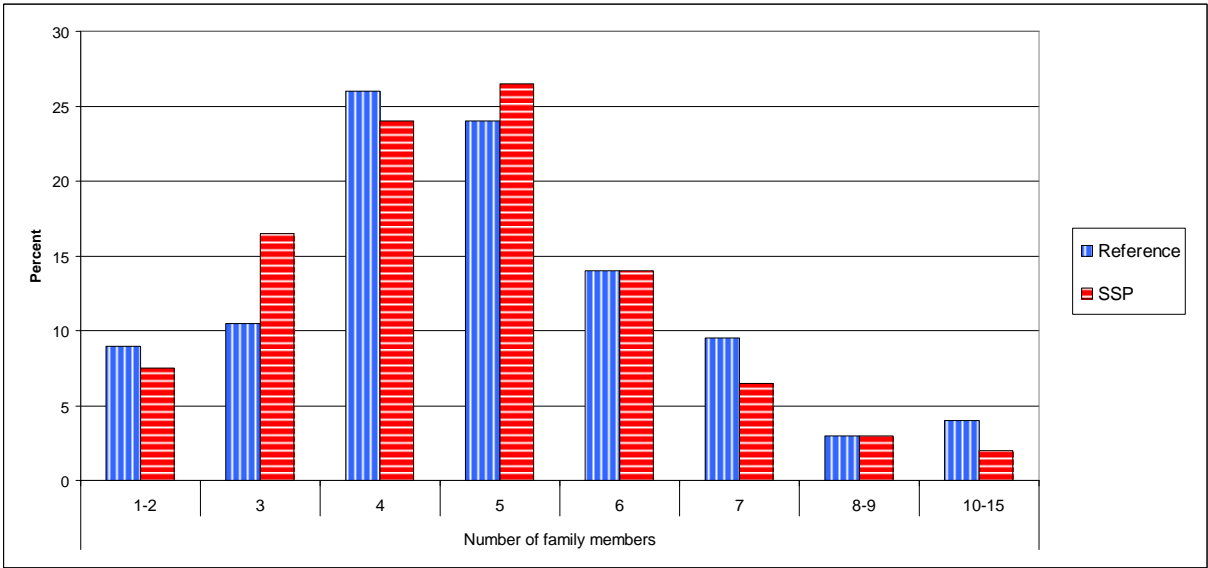
The households in both reference and SSP study groups have a very similar size of 4.8 household members. Thus, the survey is exactly in line (4.8) with recent demographic census data for India (IIPS/India 2007). Therefore, predominantly the classical family with two parents and three children can be seen. All age groups from birth to the age of 25 years are fairly evenly distributed. The elderly (65+) only constitute a smaller fraction (0.6-0.8 persons) of the households.

**Table 8: Average number of household members per age group**

Age group	Reference		SSP	
	M	F	M	F
0-5	1.0	0.9	0.9	1.0
6-10	1.1	0.7	0.9	1.0
11-14	0.9	0.8	0.9	0.8
15-25	1.2	1.0	1.2	1.0
25-64	1.4	1.2	1.3	1.3
>65	0.7	0.6	0.7	0.8
Total	4.9		4.7	

If we take a closer look at the variation on size of household, it can be seen that the two thirds of the families are in the wider range of 4 to 6 persons. Very small households of 1-2 persons constitute only 8% of the sample. Households with 3 persons are a little more frequent and range from 10% (Ref.)-16% (SSP). Larger households with 7 persons are found in 10% of the cases while households with 8 or more members are again rarer. The largest household interviewed had 15 members in total. The comparison between the two study groups does not show major differences. The number of children attending school is equivalent for both groups and stands at 1.2 children on average per household.

**Figure 7: Distribution of household size in percent**



The educational status of the respondents shows that the level of illiteracy is fairly high. In the reference group 40% of respondents do not have any educational degree while the SSP group 36% do not have even primary education.

**Table 9: Education level of interviewee in percent**

	Reference %	SSP %
1. None	40.0	35.5
2. Primary / up to class 4	11.5	10.5
3. Primary class 5 to 7	17.5	21.0
4. SSC (810th)	22.5	27.5
5. HSC (10 + 2)	5.5	4.0
6. Diploma / degree	3.0	1.5
7. Post graduate	0.0	0.0

The most common educational degree is SSC up to class 10 (23-28%) followed by primary up to class 7 with 18-21% of respondents. All higher educational degrees combined only attain 8% with a little advantage in the reference group. Overall, if all differences between groups in all categories are totalled, the attainment of educational degrees is some 9% better in the SSP group compared to the reference group. This gives a slight indication that a few more households of higher social status are represented in the sample selected.

Regarding marital status it can be said that marriage remains the strict norm. 90% of SSP households are married and in the reference group the rate is slightly higher (94%). Single or separated households account for less than 1% of the total sample. The fact that SSP is working directly with women may be the reason why widowed households are more frequent (10%) compared to the reference group (6%).

Considering the focus of this study on household income effects, education and marital status are important factors that have an influence on household income. Typically, households with higher educational degrees have higher income while female headed households generally record lower income. Therefore, it can be concluded that the SSP group has a little advantage due to more households with higher education; however, this effect is mainly compensated by the higher number of widowed households.

Overall it may be concluded that the both samples are matching well and that any biases should be within the commonly used error margin of +-5%.



### 3.3 Climate change and long term development of rainfall in the region

Semi-arid zones are known for a strong variation of annual precipitations. This factor also affected this study considerably. The discussion with project staff and farmers highlighted that the last two years up to April 2016 have been severe droughts. In order to rate the "gravity" of the droughts, the research team analysed the long-term trend for precipitations in the last 75 years. This long-term view helps to understand to what extent the current situation differs from the normal rainfall situation.

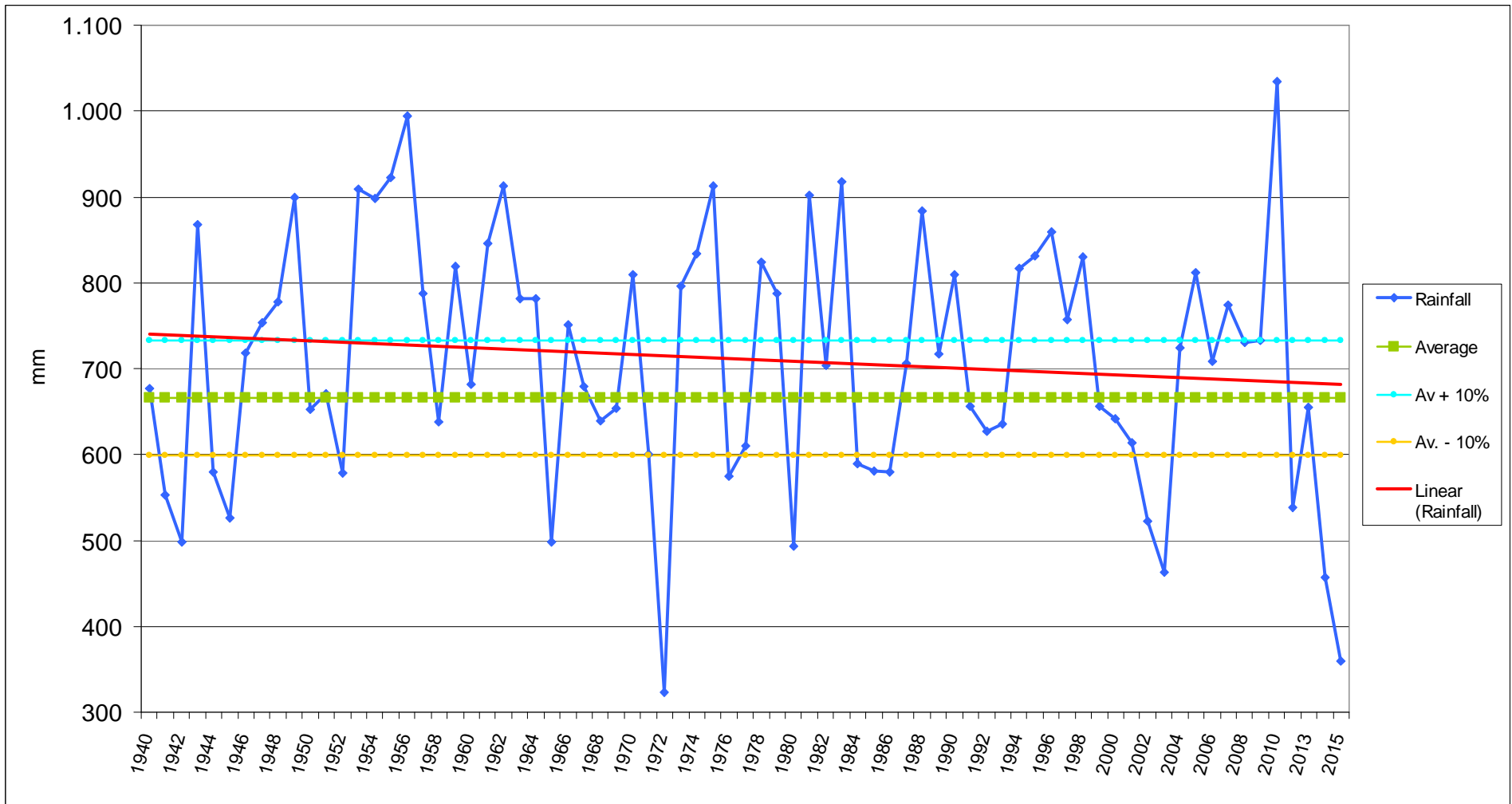
The next figure illustrates the historic trends on rainfall based on the specific local rainfall data available for Osmanabad District. At first sight the chart may look like a chaotic permanent up and down without major clear trends. To provide some guidance, the overall average rainfall for the whole period of time (1940-2015) is computed with 666 mm rainfall. This overall reference is shown in the figure as the green bold dotted line. Then, the bandwidth for normal rains that corresponds to the average rains plus or minus 10% of rainfall is added. In the chart the -10% line (599mm) is shown in orange colour and the +10% line (733 mm) in light blue colour. With the help of these reference lines it becomes much easier to understand the ups and downs of the chart and some patterns can be identified. Counting the number of years that fall within this middle zone that can be tagged "normal" rainfall years it comes to 23 years out of 75.

Thus, only 1/3 of the years are "normal", the remaining two thirds are either wetter or dryer. The variation within these wetter and drier zones is huge, roughly twice the width of the normal zone. This is a typical characteristic for the semi-arid climate zone, that variation is larger than in other zones and therefore farmers need to adopt there farming to this constraint much more than farmers in other zones<sup>24</sup>.

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<sup>24</sup> The basic characteristic is not new, however, new in the context of climate change is that the range of variation is widening further, and therefore an already difficult situation is becoming more difficult.

**Figure 8: Long term rainfall trend for Osmanabad district for the last 75 years**



Source: [www.indiawaterportal.org/met\\_data/](http://www.indiawaterportal.org/met_data/) for 1940-2002; Governm. India 2013; and KVK 2016 pers. communication

**Figure 9: Some pictures illustrating the drought and its many consequences**



April 2014, all tamarind trees seen dried up and in August some trees had recovered.



Long queues for drinking water and dried up irrigation water tanks.

**Weddings can wait as water train rolls into parched Latur**  
 Young and old turn up at station as Jaldoot Express carrying 25 lakh litre of water arrives, households hope they can now get water 'every four days'

**MANOJ MORE**  
 LATUR, APRIL 20

MINUTES AFTER the 90-wagon Jaldoot Express pulled into Latur railway station carrying 25 lakh litre of drinking water — enough to take care of the city's daily needs — Kavita Kamble and her family became the first ones to receive a 200 litre barrel at their doorstep.

"I can't believe the water has come from Miraj straight to our residence. It's a lucky day for us — I was just stepping out to go for my daughter's wedding," said Kavita, 40, who lives in Kranti Nagar.

The train had left Miraj in Sangli district, about 342 km away, at 10.55 pm Tuesday. After it reached Latur Wednesday morning, tankers made 450 trips to bring water to each household. Usually the tankers collect water from three nearby dams, which are also beginning to run dry. The train had previously made nine such trips with 10 wagons, carrying 5 lakh litre of water each time. The Indian Express was at Latur station Wednesday morning, when Jaldoot pulled in.

7.52 AM: As Jaldoot arrives at Latur railway station, railway workers gather, connecting pipes to collect water. Twenty minutes later, the decanting process starts. The train has reached later than expected "because of three express trains that run on the section during the night", explains RK Sharma, senior divisional manager (operations), Solapur division of Central Railways. During the day, says Sharma, they have been running Jaldoot almost like a superfast train. "On one occasion last week, it reached in 6 hours 35 minutes, logging a speed of nearly 50 kmph — almost like superfast train. Today's delay was a one-off thing," says Sharma. The driver, too, says they had to wait at Doko station for nearly an hour to let an express train pass.

8.10 AM: The 'Jaldoot team' of driver S B Khot, assistant loco

**WATERLESS IN MARATHWADA**

Kavita Kamble was about to head to her daughter's wedding when the water tanker arrived. Pradip Des

**CONTINUED ON PAGE 2**

The press is full of drought related articles

**To save money for water, Latur residents postpone surgeries**  
 Patients shy away from private medical care, opt for government hospital

**WATERLESS IN MARATHWADA**

**MANOJ MORE**

नियंत्रण कार्यक्रम जिल्हा बसनेस केंद्र लातूर

This highlights that wet and very dry years may be very pronounced. If we count the much drier years with rainfall below 500 mm (>-25%) it comes to 7 in 75 years. Thus, we can conclude the probability of very dry years is about once in every 10 years or 10%. Almost the same applies to the rainfall peak years with above 900 mm (>+25%) where we count 9 years. If we look at the extremes, the worst drought was in 1972 with only 323 mm and the biggest flood only recently in 2010 with 1034 mm.

Thus, the current drought is the second worst in 75 years of time! If we consider a two-year period, then the current drought is the worst in the whole period, because the duration of the 1972 drought was only a single year. This double stress pushes farmers and the society to its limits.

Can farmers adapt to these extremes? Yes, they can - but with a lot of hardship. If we examine the curve of the chart again more closely we can identify some typical patterns. If we examine periods of a few consecutive years, we see that the weather often stays

"meta-stable" for 2-3 years in one zone, before it moves on. That means some good years come in a row followed by some bad years in sequence. This simple pattern can be used for farming. After some 2-3 good years, farmers definitely should be prepared for

deterioration. This is also seen by the start-up of the rains in 2016. During the findings workshop in August, the monsoon had returned and already 60% of average rains were recorded. If we compare these global

**Interaction with Dr. Vilas Takankar from Krishi Vigyan Kendra**  
**Q. What will be future trends for the climate?**

Climate change has become a buzzword and it is prominent in all recent development programmes in the last years. In December 2015 the global community finally agreed to attempt to set up firm measures to control global warming to below 2C, possibly even below 1,5C by the end of this century.

The latest report of the International Panel on Climate Change (IPCC 2014) predicts a number of likely climate trends:

1. Precipitations will be ever more erratic, with stronger peaks and fluctuations.
2. Rains will be less evenly distributed in the course of the seasons.
3. The frequency of heavy downpours with thunderstorms will increase while soft more gentle rains will decrease.
4. In line with increasing temperature, overall precipitations will increase too. However, this increase will not come as an add-on that is equally distributed everywhere, but rather it will lead to more regional disparities. Some regions may become drier while others become wetter.

projections for climate change with the reality we could observe in Osmanabad District, we see strong evidence that support the above general trends:

- Regarding above point one (stronger peaks) we see that the wettest year (2010) and the current worst drought fall within the last 10 years.
- The dotted red line in our chart shows the general trend of precipitations for the last 75 years. We see that rainfall has declined slowly by about 100mm from 770 mm in the 1940s to about 670 mm today. This confirms the above point 4 in the above box for changes in long term trends.

The last point was also confirmed the director of KVK station in Tuljapur. He mentioned that the research station was originally founded to start working on rice. Due to the climate getting drier, the station's focus has shifted many years ago already on drier crops such as pulses.

The real future for the region remains unpredictable<sup>25</sup>. If the trend of the last century prevails, Osmanabad region could become even drier in the near future. But if the trend tips, it may also become gradually wetter again.

In order to address the problem of climate variability, farmers in the region have no other choice, but to come up with a good resilience strategy. SSP farmers have gone a good way in becoming more resilient. This is examined more closely in chapter on resilience.

The analysis of rainfall trends over the last 75 years shows very clearly that the period of this survey falls into a very extreme year.

**Therefore, the findings that will be discussed in the main chapters of this report need to be interpreted with special care. The situation captured by the data is that of a very severe drought year, not the typical situation of a normal production year.** In particular production figures are strongly depressed due to this drought. Consequently, it is not possible to review the progress made by the project in a strict sense.

With the help of the qualitative interviews done in August after the original household survey, the research team tried to gain some additional information to estimate what might be the agricultural yields for normal years of precipitation. This additional information can help to gain a broader view on the situation on the ground.

### 3.4 Land and access to irrigation water

Land and labour are two decisive production factors for farming in India. Consequently, it is important for any study to obtain reliable information on the land holding size of farms. The fieldwork conducted indicated that farmers know the size of their farms well. Due to the wide spread use of oxen and tractors, the farm plots have rather accurate rectangular shape and the size of plots can be measured without major difficulties. For the purpose of the study the research team relied on farmers' information only. The most common land area unit is the English acre (0.4 ha). For smaller plots farmers use the unit Gunta (1 acre = 40 gunta). The team used gunta units to record the crop area size and acres for the total area of the farm. In order to understand the dynamics of land use better, in depths questions on land were added in small focus groups.

SSP's extension model is focused on small farms and tries to convince women to start growing organically on small areas of land usually less than one acre and to proceed to integrate these practices on a growing farm area over time. For this reason the study team decided to select the smaller farms in order to ensure that the benefits of the 1-acre model can be recorded well and do not become "diluted" by integrating too many bigger farms where the concept might only be applied small scale. For this reason a cut-off point of 3 acres as maximum farm size was applied. Another advantage of this approach is that it helps to reduce variation and related biases and thus it is easier to validate if differences between the study groups are statistically significant.

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<sup>25</sup> It might be interesting to consult the latest Indian studies for regional climate change projections. However, it should be noted short term climate projections (to 2030) are more difficult to compute and have a higher margin of error than long term projections up to end of this century (personal communication at the climate change help desk Helmholtz Institute, Potsdam).

## ***The farming families' views on land changes***

Land is the most precious resource for farmers. Due to the rising population, access to land is getting ever more precious. This is felt very obvious in the personal talks with the various peasant families.

### ***How much land did families own 20 years ago and how is it today?***

These many years back we had more land. Fewer families were living in our village. Each family was smaller and had a little more land. So we did not need to cultivate all the land for food. We could leave land just for fallow.

Today it is much different. Many more families live in the village. Owing to the high number of dependents, land fragmentation is getting more and more. Today farmers are forced to reclaim barren land. In the old days such land was considered as impossible to cultivate. FGD, Devshinga

### ***How is land passed on from one generation to the next?***

Land fragmentation is still followed. Family land is divided between the sons and followed for generations – this leads to small fragmented lands. Women do not inherit land. It all stays with the sons. FGD, Tirth Khurd Village

Land fragmentation is a big problem. Families try to keep the land within the family. However, with each generation and the new subdivision, the land holding has come down. People cannot depend on farming as only source of income today. People need to take up alternate businesses to diversify the livelihood opportunities. FGD, Devshinga

### ***Is land grabbing frequent?***

Earlier, we used to go to moneylenders for taking loans and they were using our land as collateral. It could happen very often that families could not repay loans and in that way many families lost their land to scrupulous money lenders. Now that we are members of SHGs, we do not take loans from the moneylenders any longer. Hence we do not face any such problems. FGD, Devshinga

### ***Do you have land titles?***

*"Yes, we have land titles. This is very important to us. Earlier we used to be afraid of all the procedures as we did not have much information on all the regulations. Now, as we are part of the SSP group, we are well informed about the land laws and we know our rights better".* Ms. Archana Patil, farmer leader, Devshinga village

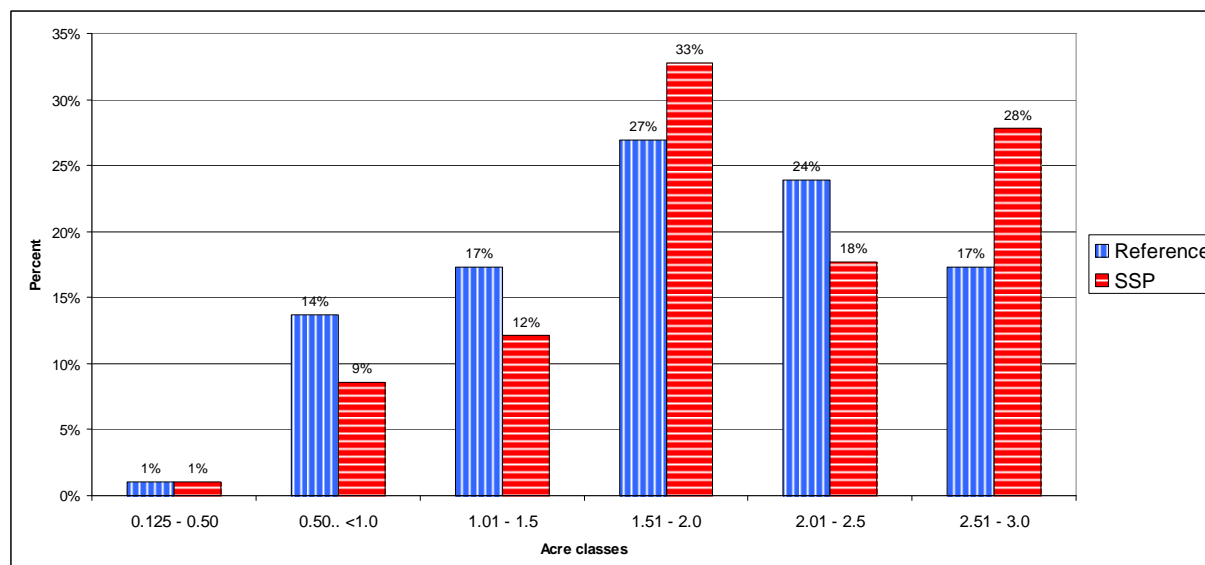
### ***Do you have any plans to develop your farm by buying land?***

Many families keep their land and never sell it. This leads to a good stability of land ownership. A good example for this probably most common attitude is Ms. Barkhabai Jadhav from Medsinga village: *"I did not buy or sell any land in last 15 years"*.

However, discussions with low adopters on SSP practices showed that in particular the farmers with very little land (<1 acre) tend to prioritize jobs outside agriculture and do not consider buying new land. But there are also exceptions to this rule. New SSP farmer Mrs. Nanda Garad, Ansurela Village moved from landless status to a 1 acre farm that has become fully organic. She used the money from her sons that work in the city to reinvest in agriculture. Due to the new agricultural knowledge, she can now benefit from the use of land.

The same holds true for slightly bigger farmers that consider buying land again in particular those educated by SSP that learned how to earn more money from farming. Ms Vanitha Balbhim Memshti from Chiwari village. Due to the work with SSP and encouraged by the success of the work, she decided to rent another 3 acres of land to increase her holding size.

**Figure 10: Farm size histogram**



Average farm size in both groups is 2 acres (0.80 ha). The histogram shows that in the SSP group farmers in the category 2.5 to 3 acres are a little more frequent, while in the class 1 to 1.5 acres reference group farmers are a little more common. Overall, the differences are not very pronounced.

As was shown in the previous box on land, ownership is very stable. All farmers stated that no land was bought or sold during the last 5 years. A little surprising to note, however is the fact the market for renting farm land seems to be almost inexistent. The interviews showed that only some few farmers were sharing land with relatives.

If we shift from the median term of five years to the long term time period, it can be seen that the land area per farm shows a slow gradual decline in cultivated area per farm since the 1970ties to today from 2.28 ha in to 1.16 ha in 2011 (NABARD 2014). Our own calculation indicates that this corresponds to an average decline of 1.64% per year.

A very important factor for sustainable farming practices is fallow. Fallow is a natural process to restore soil fertility. In this respect the findings give major reason for concern. In case of the average farmers with up to 2 acres of land the fallow practice is abandoned completely. Only the bigger farmers above 2.5 acres managed to keep half an acre of land fallow. Similar farmers did not keep any land under permanent pastures. Farmers need to rely on farm bunds and crop residues for feeding their animals. Access to communal grazing lands is very limited and exact data could not be obtained. In some villages these grazing lands exist, however, the area size is getting smaller too, and very often this land is allocated for use to the landless population. Combined with the drought this land scarcity for fodder leads to a heavy fodder scarcity. As an emergency measure SSP promoted hydroponic fodder production by growing green fodder from maize seeds. The success of this measure is discussed in the crops section.

Farmers in both groups do not have land under forest or woodlots. A farmer may keep some few trees on the farm bunds and on some free spots within the village, but farmland is considered too scarce and farmers fear the shading effect of trees on crops. Some little forest areas in the upper watershed further away from the centre of villages exists. However, these forests areas are limited in size and often trees are small due to firewood consumption. *Moringa oleifera*, also called drumstick or horseradish tree,

produces very healthy leaves and pots that can be consumed as vegetables. SSP has been promoting the tree, but due to the short intervention time in combination with the drought, still very few farmers in both study groups cultivate the tree.

An important question for SSP is how many farmers have adopted the 1-acre model and to what extent. The results are shown in the next table. It can be seen that the average area under the model increased from 0.43 acres in 2012 to 0.84 acres in 2015. This means that in 2015 42% of the land of an average 2-acre farm was converted to this model of more ecological farming practices.

Access to irrigation water is a vital production factor for farmers in the study region. Farmers can produce crops only during the main rainy period the monsoon (kharif) between June and October. On some few good lands also a winter crop (rabi) with the scarce winter rains is possible. In general supplementary irrigation is needed to produce successful winter crop in between November and February. In the very hot summer season from March to May irrigation is obligatory for any crop production activities.

### ***Irrigation water: benefits and risks***

All farmers expressed the wish to invest in irrigation, in particular during the current severe drought.



If water can be found, the benefits for the household are generally manifold. In particular if modern irrigation techniques such as sprinkler or drip irrigation are used, farm production can be increased manifold and prices during the dry season are also better.



Woman from Tuljapur block shows her production due to drip irrigation.

However, most farmers do not have sufficient money to pay the fees for drilling for water and the chances to find water are equally limited. Ms. Laxmi Dattatray Birajdar, Chiwari village tells us about her misfortune drilling for water. The family drilled for water 10 times at a total cost of 20,000Rs (269€). All the savings of her son that works as a lorry driver were used up for these failed attempts to find water.

The Indian Government should invest more into water saving irrigation technologies and invest into water retention structures on community level so that many farmers can obtain access to irrigation water. More measures to encourage water infiltration such as farm bunds, small check dams and afforestation are equally needed to ensure that ground water is replenished and so that the general productivity of all vegetation in a given watershed area can be heightened.

Access of farmers to irrigation in this study is shown in the next table. The data reveals that half of the reference group farmers and 35% of SSP farmers do not have any access to irrigation. Among the later 34% have access up to 1 acre of land during winter. Only a small minority of farmers (6-7 %) in both groups have the possibility to irrigate all their land. Most common type of irrigation is flood irrigation. More modern types of water saving irrigation are not very common as yet. However, the work of SSP to promote these technologies shows some first impact: 4-9% of SSP farmers use these advanced techniques while only 2-4% do so in the reference group. This is certainly a good result



considering that due to the drought, farmers did not have many surplus funds available to invest and the project funds to subsidise these were equally very limited

**Table 10: Percent of farmers with access to irrigation during the winter season**

Type of irrigation	Area irrigable acre	Reference	SSP
Flood irrigation	None	50,5%	35,0%
	0.1 - 1	24,0%	34,0%
	1.1 - 2	19,5%	24,0%
	2.1 - 3	6,0%	7,0%
Drip irrigation	> =0.1	4,0%	8,5%
Sprinkler	> =0.1	2,0%	4,0%

It would be desirable to promote more use of drip irrigation and reduce also the area under flood irrigation to save water for the priorities of a new funding phase.

### 3.5 Labour

Like in any economy labour is a key factor in the Indian agricultural sector. To start the analysis on labour we first look at the labour available in families and then we look at how much labour is hired. The data indicated little differences between the two study groups and these differences were not found to be statistically significant. For this reason a general description of the data without detailed reference to any of the groups is given here.

Family labour is determined by the number of household members in working age. Both groups have five household members and the means calculated are only very little below five (R: 4.9; SSP: 4.7). Simplified, we could say this represents a family with 2 adults and 3 children. Due to the fact that the extension programmes focus on people in working age, the elderly are somewhat underrepresented here. The child dependency ratio is slightly higher in the reference group compared to the SSP group.

**Table 11: Persons and calculated labour units**

	Reference	SSP
	Mean	Mean
Total h/h size	4,9	4,7
Male 0-5	1,0	0,9
Female 0-5	1,0	0,9
Male labour units	2,0	1,9
Female labour units	1,7	1,7
Child dependency ratio (children under 14 / productive age 15-65 years)	44,6%	35,3%
Total labour units	3,6	3,6

To examine how much labour could theoretically be available for farming, labour units were calculated<sup>26</sup>. Labour units give an indication of how much labour is available on farms by taking into account the different physical strength of persons in different age groups. The calculation showed that both groups would have an average of 3.6 persons working full time throughout the year. Here we would speak most typically of husband and wife and 1.6 daughters or sons that have reached full working age (15-65 years).

For a more precise picture, the exact time spent on farming, household, business and off-farm migratory work was computed for husband and wife and other youth or adults living in the household.

The labour calculations show very clearly that families depend on various sources of income. Husband and wife each spent around 150-190 days on farming. Women spent another 220 days<sup>27</sup> in the household and they are helped by the younger daughters that also spent around 130-150 days on household work.

<sup>26</sup> Definition of labour unit according to age groups

Age group	0-10	11-14	15-18	19-65	>65
Labour unit	0	0,3	1	1	0,3

<sup>27</sup> Eight hours is considered as one day

Off-farm activities account for fewer days and here the variation among the households is high. Only about a quarter of households manage to find an outside jobs or take up an own businesses. Men spent close to a 100 days per year on their own business or outside jobs while women allocate less time (73 days). Outside business opportunities for the youth and young adults provide work in the range of 121-157 days. Often they have jobs like drivers or the more educated sons or daughters may even have better jobs in the cities and contribute regularly to the family in the rural areas. It should be noted that labour patterns show a very high variation, while a good proportion of families do not find any jobs at all; others manage to find several paid jobs for all household members.

**Table 12: Calculated labour days per year and household for major activities <sup>a)</sup>**

	House hold		Farm		Business or outside jobs	
	Reference	SSP	Reference	SSP	Reference	SSP
Husband			169	169	98	95
Wife	225	219	158	192	73	73
Other youth or adults	148	133	121	109	157	121
<b>Total</b>	<b>373<sup>ns</sup></b>	<b>352<sup>ns</sup></b>	<b>451<sup>ns</sup></b>	<b>478<sup>ns</sup></b>	<b>329<sup>ns</sup></b>	<b>289<sup>ns</sup></b>
Hired farm labour			55	62		
Total labour (family & hired) per acre of land owned			261 <sup>ns</sup>	283 <sup>ns</sup>		

<sup>a)</sup> 8-hour working days was assumed. Shorter activities such as daily 2-hour activities were recomputed into equivalent 8-hour days. <sup>ns</sup> Differences not significant

All household members combined spent about 450-478 days on farming and 289-329 days in off-farm activities.

While the poor families do not hire any farm labour during the year, average families hire farm labour for 30-40 days while the bigger farms may hire up to 200 days. None of the households employed any permanent farm labourers. Families needed 261-283 farm working days per acre of land.

It should be noted that the labour profile presented is also influenced to some extent by the fact of the drought. Many families indicated that there are less job opportunities due to the drought.

Summarizing, it may be concluded that the families spent a little more time on farming (57%) compared to outside jobs (43%). Considering that income from farming and income from other sources contributed about 50/50 towards total income of SSP farmers, it may be concluded that the return per labour day in off-farm activities was about 1/3 better compared to farming. Considering that India is a country with a fast growing industrial sector, it is not surprising that rural agricultural incomes have difficulties to compete with the urban areas. SSP's work has contributed to increase farm incomes and consequently helps to reduce this urban/rural income gap. The low farm production level caused by the drought certainly introduces a negative bias into the comparison of attractiveness of farm and off-farm activities. It may be assumed that in years of normal rains the attractiveness of farming is considerably better.

## **The farming families' views on labour**

### **Are SSP promoted organic farming practices more labour intensive?**

*"Yes. Organic farming requires more labour. Production of farmyard manure and vermicomposting requires extra work. Using more farmyard manure in the fields leads to a higher infestation of weeds compared to just using chemical fertilizer. The extra weeds need to be removed manually. For the weeding we often go for shared labour. In the group the work becomes easier". Ms. Archana Patil, farmer leader, Devshinga village*

Organic method is more labour intensive. Removing the weeds is extra work, but we women in the groups help and support each other in our farms. We share resources if required and share the work in each other's farms. FGD, Devshinga village

*"I work 7-9 hours own farm. My husband works 4-5 hours on the farm. Doing the sowing of the many more different crops and harvesting now is more work. In the monsoon there are also more weeds due to the farm yard manure. Weeding is manual and hence more labour compared to using a herbicide. But we use the bullocks for weed control too. That is helpful and faster also than hand weeding". Ms. Barkhabai Jadhav, Medsinga village*

### **Do you share labour as a strategy to overcome labour shortage problems?**

*"Yes. The exchange between us women works well. Even before SSP came we were helping each other. But we started two years ago and reinforced the practice. Now we collaborate on joint work more often". Ms. Barkhabai Jadhav, Medsinga village*

For the weeding we often go for shared labour. In the group the work becomes easier. Ms. Archana Patil, farmer leader, Devshinga village. Keeping up and reinforcing old traditions is also liked by men. Archana's husband smiles and confirms that he likes the labour sharing activities too: *"I am also happy with the system. It is a traditional thing for us"*.

### **Are people well employed on the farm alone or do they have to find other jobs as well?**

No, the farm alone is not enough. The farm provides us only with seasonal employment. 4-5 acres of land is sufficient for providing full employment to three people only. The other 2 family members only find some seasonal work on the farm.

FGD, Devshinga village

If 5 people make up an average household of 5 acre land – then usually 2 people can work on the family land, 1 can look after the livestock and others can engage in farm labour in the other farms in the village. They also engage in seasonal labour outside the village. FGD, Devshinga village

*"6 acres are needed to feed a family of 6 persons for food and cash needs. This requires good farm planning. If you only have 1-2 acres, other income sources are needed". Ms. Surekha Jadhav, Medsinga village*

### **Is it easy to find other job opportunities?**

We can find opportunities under MGNREGA and in the fields of other farmers. Those who own bullocks also go to other farms for ploughing and intercultural operations. Some are involved in petty shops, dairy farming and poultry, while others can find some skilled labour such as masons in the nearby city of Tuljapur. FGD, Devshinga village

*"In our village here there is only casual labour to find. The problem is now that with the drought there is so much less labour than usual. Even the big farmers do not have work for us. A lot of land is idle, not planted. There are some few jobs such as mason, unskilled labour, or helping in shops. Some educated people go to Pune and those less educated stay in near by places. In our village here there are about 450 households. In total there may be some 25 that find a government employment. Some other 35 may have other jobs such as sugar factory workers or drivers. We are 3-4 that have a little milling enterprise like me". Ms. Surekha Jadhav, Medsinga village*

### **Do you prefer working on your own farm or in others farms? Where do you earn more?**

(Laughing). We prefer to work on our own farms. FGD, Devshinga village

### 3.6 Household assets and farm investment

Assets are important indirect indicators wealth that gives a good indication on income trends in the past. For this purpose the study reviewed the housing situation and a number of typical household and farm assets. The findings are depicted in the next two tables.

The data highlights that practically all households own a house of good standards. Permanent brick wall are a little more frequent for SSP farmers (81% vs. 75%). The poorer standard of mud walls is rather uncommon for both groups (15%). For roofing material iron sheets are the norm and only very few households still rely on thatched roofs (<1.5%).

**Table 13: Quality of housing on farms (multiple answers)**

	Reference %	SSP %
House owned	100.0	99.9
Permanent (bricks)	74.5	81.3
Mud walls	14.5	15.7
Stones	6.0	2.5
Wood, tin, other	7.5	4.0
Iron sheets (ACC)	94.0	93.0
Concrete (RCC)	4.5	7.0
Thatch	1.5	0.5

The general household endowment with assets shows rather few differences between both study groups. Practically all households possess (95-98%) a mobile phone and also 2/3 keep a TV set. Transport is more limited as only 39% own a bicycle. SSP farmers own motorbikes more frequently (41% vs. 33%) but the reference group is a little better off in terms of motor cars and tractors. However, the later assets are still very rare (all below 2%). Less than 1/5 of farmers own any major farm machinery such as ploughs, drills, or sprayers. A major difference is recorded only on stables for cow; here the SSP group is leading (33% vs. 23%).

**Table 14: Household assets (multiple answers)**

Household assets	Reference %	SSP %	Advantage SSP %
Phone, mobile	95.0	98.0	3.0
Television	62.6	65.3	2.7
Bicycle	39.4	39.3	-0.1
Motor bike	33.3	41.3	8.0
Sewing machine	15.7	22.5	6.8
Fridge	12.6	14.8	2.2
Second farm house	4.0	4.6	0.6
Motor car	3.0	1.5	-1.5
Solar products	1.5	4.1	2.6
Auto (tricycle)	0.5	0.5	0.0

Overall, it may be concluded that the endowment with assets does not show major differences between both groups. As assets indicate the longer term income development, it shows that both groups started on similar wealth levels before the project intervention. In the last five years that were characterized by two very bad years

during the drought it is rather more likely, that people had to sell-off assets rather than to accumulate.

### ***Farm spending and investment***

Expenditure and farm investment is linked to the respective income levels of households. As income generally shows a strong variation, also expenditure is subjected to variation. For this reason, the presentation of the findings is not based on the means, but rather on the median<sup>28</sup>, and in order to display the full range of expenditure variations on percentiles<sup>29</sup>.

**Table 15: Farming costs (Rs.) in lower, median and upper percentiles**

<b>Farm expenditure</b>	<b>Group</b>	<b>P10</b>	<b>P50</b>	<b>P90</b>
Labour cost	Reference	0	4,575	19,500
	SSP	0	6,613	17,000
Seed and planting material	Reference	1,000	4,600	10,500
	SSP	210	4,000	10,000
Fertilizer chemical	Reference	0	2,900	10,835
	SSP	0	3,200	10,928
Livestock feeds, vaccines, medicines	Reference	0	500	17,000
	SSP	0	2,000	20,000
Rent of machinery (tractor, threshing)	Reference	0	500	2,370
	SSP	0	750	2,990
Maintenance and repairs	Reference	0	0	5,000
	SSP	0	0	5,000
Electricity	Reference	0	0	4,450
	SSP	0	0	5,000
Crop or livestock loans	Reference	0	0	4,000
	SSP	0	0	4,980
Pesticides	Reference	0	0	2,910
	SSP	0	0	4,000
Chemical herbicide	Reference	0	0	1,180
	SSP	0	0	1,470
Energy, fuel	Reference	0	0	195
	SSP	0	0	290
<b>Total farming costs</b>	<b>Reference</b>	<b>11,400</b>	<b>29,300<sup>ns</sup></b>	<b>88,100</b>
	<b>SSP</b>	<b>12,900</b>	<b>32,800<sup>ns</sup></b>	<b>103,000</b>

ns = differences not significant

<sup>28</sup> "The arithmetic means is a value that can be strongly biased by a few large or small outlier values. In statistics and probability theory, a median is the number separating the higher half of a data sample, a population, or a probability distribution, from the lower half. The median of a finite list of numbers can be found by arranging all the observations from lowest value to highest value and picking the middle one (e.g., the median of {3, 3, 5, 9, 11} is 5). If there is an even number of observations, then there is no single middle value; the median is then usually defined to be the mean of the two middle values (Wikipedia, 2016)"

<sup>29</sup> "A percentile is a measure used in statistics indicating the value below which a given percentage of observations in a group of observations fall. For example, the 25th percentile (also known as quartile 1) is the value (or score) below which 25 percent of the observations are found. The 50th percentile is identical with the median or second quartile (Q2) (Wikipedia 2016). In the context of this study the standard percentiles calculated by SPSS P5, P10; P25;P50,P75,P90 and P95 are used to illustrate the data.

Costs for farming are high and both groups spent close to Rs. 30,000 on median. While the poorer households only spent close to Rs. 12,000 the bigger farmer households spent about triple the amount of the median farmers. Spending is slightly higher for SSP farmers; however, the differences are small and statistically not significant. The biggest cost items in all groups are labour followed by seeds and fertilizer. Due to the fact that SSP promotes the use of own seeds by farmers, the cost on this item may be a little lower, but the difference is rather modest (Ref. Rs. 4,600 and SSP Rs. 4,000). The data shows that SSP farmers spent slightly more on chemical fertilizer than the reference group. Due to the promotion of organic practices, the initial expectation was that these costs might be lower compared to the reference group. However, considering that the focus of extension is on the women who only control a certain proportion of the land, it is evident that the men may continue with their traditional older practices for some time. This may be the reason for continued spending on chemical inputs. Another explanation could be linked to income. It is obvious that the poorer farmers (P10) do not spend anything for most items; they are "organic by default". It is only on the median, and particular on the upper spending level, that bigger differences between the groups become apparent.

The same reasoning may apply to spending on pesticides and herbicides. Here, spending in the P90 SSP group is slightly higher compared to the reference group. SSP farmers spent a little more on labour and for livestock purposes; however, also here the differences are minor. Cost for machinery, repairs and maintenance only occur for farmers in the upper income group and constitute 17-20% of all costs in these upper income groups.

Overall, it may be concluded that there are no major differences between both study groups. The minor differences recorded are not statistically significant.

The level of long term farm investment recorded for this study was extremely low. Investments in buying land, or other major machinery or even loan repayments for equipment were zero for all groups. This low investment behaviour can certainly also be attributed to the two consecutive droughts that prohibited farmers from investing on major farm assets.

## 4 Main findings

### 4.1 Social change and empowerment

India has undergone considerable social change in the last 20 years. SSP has been a major NGO to support this process of social change. SSP used the nutritional problems as the entry point to design an intervention of social change and empowerment for women and their families. In close dialogue with women farmers in the region, SSP designed the one-acre model and envisaged to bring in women farmers forward to take control of their nutritional requirements of the household, by planning and producing required crops for the household under their own account. Besides more efficient production systems, it was hoped that a stronger role in marketing of surpluses would help women to gain more own income and social status. SSP built the capacities of selected women farmers as leaders who were envisaged to act as change agents that could bring changes in their lives as well as that of others. Also, it was easier for the women farmers to learn from the experiences of women leaders whose socio economic background was similar to theirs. In addition, implementing the project through women leaders ensured sustainability of the model even after SSP withdraws from the area. Hence, the project was implemented through women who were leaders of their respective producer groups. SSP would train members of producer groups on various practices to be taken up under the one-acre model through demonstrations and classroom discussions. Leaders of the producer groups who acted as role models and change agents took these practices to other women farmers in the villages. SSP has been training several women as entrepreneurs through Sakhi Social Enterprise Network (SSEN). Also, SSP has been implementing projects such as WPower, wherein women from the villagers have been selling alternate energy products such as solar lanterns, biogas based cook stoves, solar water heaters and so on.

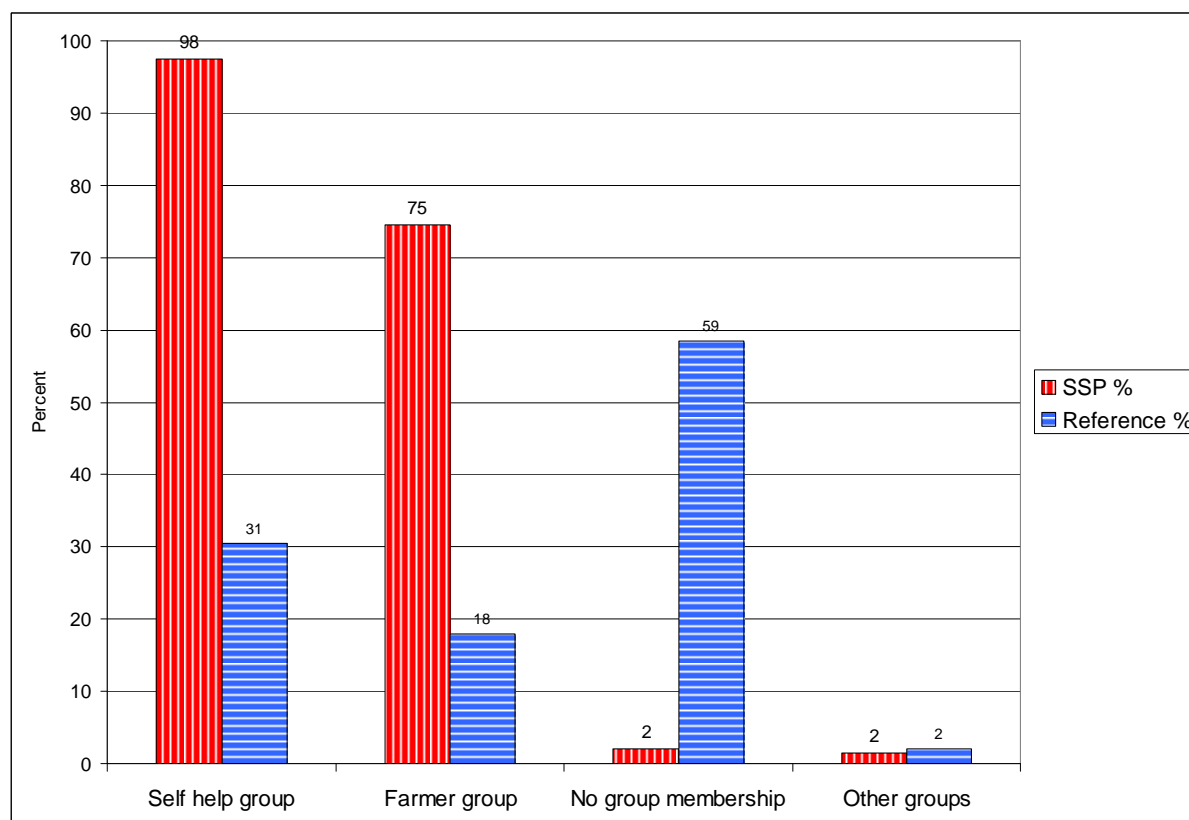
Trainings on group leadership were provided to selected individuals who displayed good abilities and traits of leaders. 65% of adopters of one-acre model were trained on group leadership as compared to 22% members of the reference group who attended similar trainings at SSP as members of Self Help Groups. Among those women who were trained in-group leadership, 25 % have taken up the role as leaders, 22% as trainers and in 10% of the cases; they played the role as leaders as well as trainers.

Women farmers who adopted the SSP model were part of producer groups, which would meet regularly and discuss various practices that were advocated under the model. These groups were platforms for interactions with SSP, Krishi Vigyan Kendra (KVK), department of agriculture and others. The producer groups were community-based organisations for learning, experimentation and sharing of ideas. SSP facilitated the formation of producer groups and has also linked these groups to Agriculture Technology Management Agency (ATMA) for accessing information and various schemes implemented by the agency.

SSP has contributed towards the empowerment of women in particular by raising their level of organisation in terms of membership in organisations. This is shown prominently in the next table. While in the reference group, more than half of all women are not organized in any way (59%), among the SSP respondents quasi all (98%) are members of at least the SHG or in addition of the farmer groups. In addition, a small group of women have taken up other leadership functions as well.



**Figure 11: Membership of organizations**



Members of producer groups would save regularly and interlend the pooled up savings amount. SSP put forth efforts to strengthen the capacities of women members in terms of management of producer groups. Hence, members were trained on savings management, credit management and bookkeeping.

Training on bookkeeping was provided to 67% of SSP adopters. As 30.5% of the members in reference group are members of SHGs too, trainings on book keeping, savings and credit management are also provided to members of Self Help Groups by Swayam Shikshan Prayog along with other NGOs working in the area. Around 92% of SSP adopters were trained in management of savings, 83% on credit and 71% of SSP adopters were trained on both savings and credit management.

**Table 16: Training on group skills**

Training	Reference (%)	SSP (%)
Bookkeeping	24	67
Saving management	70	92
Credit management	57	83

This demonstrates that a very high percentage of women trained by SSP have acquired crucial economic skills that help them to interact successfully in groups and obtain better access to savings and credit. It is difficult to evaluate the quality and effectiveness of such trainings, but as was highlighted earlier the fact that high numbers of SSP women are active members in both SHGs and farmer groups gives them ample opportunities to practice their new skills and benefit from the advantages offered through the group membership.

The training on savings and skills may also have raised women's ability to negotiate the remuneration for daily labour. The study data shows that SSP women managed to obtain 15% better daily wages compared to the reference group. This is a clear sign of advancement for SSP women. However, the fact that the female wage rate is still less than half the male wage shows, that considerably more time and effort will be necessary to reach full gender equality.

**Table 17: Mean daily wage rate for women and men in Rs.**

	Reference Rs.	SSP Rs.	Diff. in %
Women	97	112	115%
Men	245	240	98%

Besides trainings on leadership, book keeping, saving management and credit management, women farmers were trained on various practises to be adopted under one acre model. Women who took up the intervention in their kitchen garden gradually moved towards their fields. They were encouraged to take an undertaking from their spouses allowing them to take up cultivation on an acre of land. Similarly, during various trainings importance of marketing of own produce in the market was discussed with women farmers. Based on the training programs and related interventions of the program, women farmers began to take up decisions on their farm. The study team assessed general empowerment indicators and looked at the availability of personal bank account, marketing of agricultural produce, contribution of income towards household along with health related indicators pertaining to women and other members of their households. The results show that SSP managed to increase the percentage of women with bank account from 84% in the reference group to as many as 90% in the SSP adopter group. The rather high level of women in the reference group that already access a personal bank accounts is likely owing to the efforts put forth by various banks under the Pradhan Mantri Jan-Dhan Yojana scheme (PMJDY)<sup>30</sup>, that offer zero balance and no frills<sup>31</sup> accounts with very easy new access options.

The various social improvements for the women in SSP groups are best expressed by women's own voice.

### **Opinion of a village group leader on women empowerment**

*"I feel much more socially empowered. I have taken part in exposure visits and that helped me to see what is happening outside. Now I take up farming on my own and my confidence as a farmer has improved. Now I can go and see officials at Krishi Vigyan Kendra (Agriculture Technology Centre) and other related offices. Staff of SSP helps me to get new knowledge and try out on the farm. I am also part of Self Help Group (SHG) promoted by Swayam Shikshan Prayog (SSP). The SHG is helping me to acquire savings and credit. In the group we are supporting each other. We are saving water. All these things help me save more and earn more. The moneylenders do not come to our village anymore. They charged 5-10% interest per months (60% to 120% annually). The SHG only takes 1% interest a month". Ms. Makhare, Tirth village group leader*

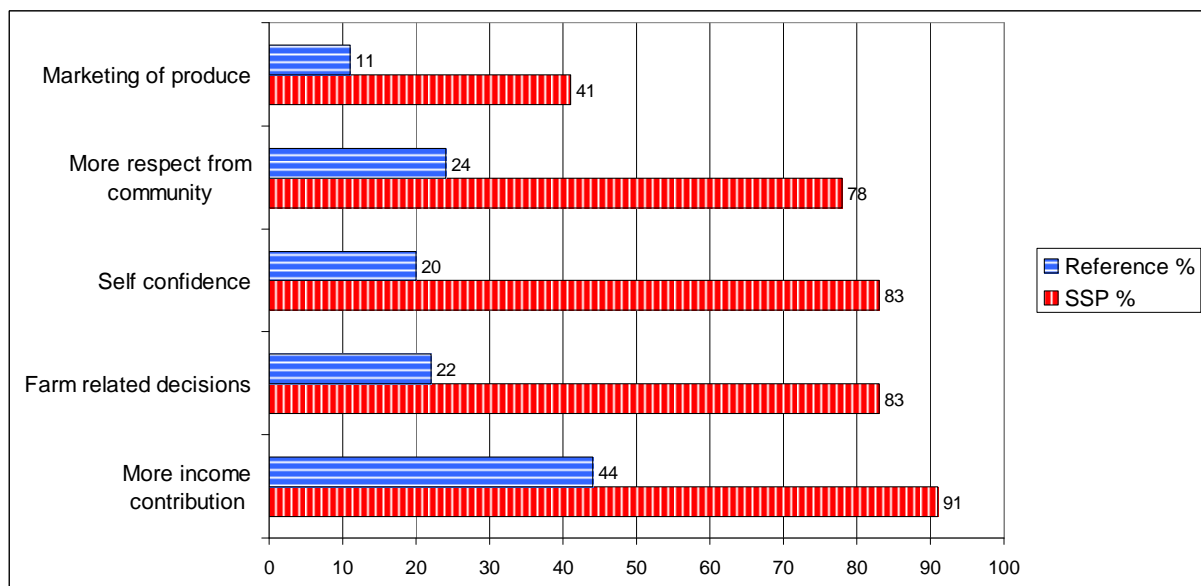
<sup>30</sup> A national Mission for Financial Inclusion to ensure access to financial services -Banking/ Savings & Deposit Accounts, Remittance, Credit, Insurance, Pension in an affordable manner. Under the mission, zero balance savings accounts are opened for financially excluded communities.

<sup>31</sup> A no-frills account is a bank account that can be opened and maintained with a zero balance, levies zero or nominal charges and does away with the unnecessary services or frills.

Decisions pertaining to crops to be sown, marketing of agricultural produce on their own, contribution of more income to the household, display of improved confidence and more respect gained from local community than ever were envisaged through the implementation of the one-acre model. As nutritional security was more important, SSP emphasized on selling the surplus produce within the village rather than selling the produce in far away markets by incurring additional costs. Perishable commodities are sold/exchanged with other households in the same village. Cereals, millets and pulses are retained for further years, which improve the nutritional security of the household. Hence, marketing of agricultural produce for women farmers in SSP model includes sharing of perishable produce along with marketing of marketable surplus if any. As far as taking decisions pertaining to crops are concerned, both men and women were encouraged to take decisions after discussing on the same rather than taking them on their own. 83% of SSP adopters have been taking all the decisions pertaining to land that they have been cultivating using the one acre model, while only 22% of women from the reference group were doing so. When it comes to marketing of agricultural produce on their own, 41% of SSP adopters do so, while only 11% of women farmers from the reference group take up marketing on their own. This can be interpreted as a marked progress of empowerment for women. The much lower percentage of women from the control group taking up agricultural marketing highlights the typical traditional scenario of women in India with respect to mobility and decision-making. Domestic responsibilities coupled with lack of experience of travelling on their own leads to limited mobility of women and hence men usually market agricultural produce on their own. Women do not have access to market information and also do not have rapport with the traders and market committee members. Hence, considering limited availability of marketable surplus coupled with dominance of male farmers in the agriculture sub sector, marketing of agricultural commodities by 41% of SSP women is an overall great achievement.

Also, as far as the display of self-confidence in the local community is concerned, 83% of SSP farmers felt that they do not fear to display their confidence in the local community when compared to only 20% of women farmers from the reference group.

**Figure 12: Selected social empowerment indicators (% of respondents)**



Ninety one percent of SSP adopters feel that they are contributing higher income to their household than what they were doing before, when compared to 44% of those in the reference group. Owing to their improved confidence levels and knowledge on agricultural practices 78% of the women feel more respected by the community than ever. As women have displayed excellent performance in taking on farm decision and in displaying their confidence in the local community, the next step could be to educate members of local market committees on the importance of women in agricultural marketing.

Adopters of the one-acre model have done extremely well as far as health and nutritional security of the household is concerned. SSP adopters are putting forth efforts to improve the well-being of their families. As a change agent at home, 92% of SSP adopters felt that they improve the health situation in the family, whereas only 32% of the respondents in reference group said so. Also, 76% of SSP adopters felt that their daughters in adolescent stage are getting enough to eat when compared to only 37% of the reference group.

**Table 18: Social empowerment – Health**

<b>Options</b>	<b>Reference (%)</b>	<b>SSP (%)</b>
You improve the health situation of family members	32	92
Your adolescent girls of the family are getting enough food	37	76
Have you taken haemoglobin tests repeatedly	50	79
You consult health services regularly whenever needed	75	92

Seventy nine percent of SSP adopters have taken haemoglobin tests repeatedly to track the level when compared to half of the reference group members. A good number of respondents from reference group (75%) and SSP (92%) do consult doctors as and when required. It is to be noted that though three quarters of members of the reference group do visit doctors as per need, SSP farmers are far ahead in terms of taking up preventive actions such as provision of appropriate nutrition to family members including adolescent girls and also in terms of takings repeated tests to ensure that they have appropriate levels of haemoglobin.

## 4.2 Crop production

Farmers in both groups grow a range of crops. The detailed crop production data are depicted in the next table. The crops in table are sorted for two criteria: first, by production volume, and second, by the number of farmers that cultivate these crops. The top section of the table shows grains and the lower section vegetables.

The overview of crops grown shows that individual farmers do grow only about 5-6 crops each. Most common crop is sorghum that is grown by 143 SSP farmers and 147 reference farmers (out of the 200 farmers interviewed for each group).

The protein rich grams are grown by about every second SSP farmer and every third reference group farmer. Vegetable growing was practiced only by very few farmers in the reference group (10-18) while almost 3 times more SSP farmers practice it (38-48). This is a certain progress; however, considering the efforts of extension work, a higher level of practitioners in the SSP group was expected. Here again we see a strong influence of the double drought that did not permit vegetable growing simply due to the general lack of water. This was also very visible during the field observations of the research team. With the return of the monsoon in August, many small vegetable gardens could be observed, while vegetable production in March during the main household survey period was limited to some very few farmers that still had sufficient water.

The most important crop in terms of production volume per farm is the food crop sorghum. Here SSP farmers attain a major production advantage (Ref. 200kg; SSP 300kg). This corresponds to a 50% increase. This indicates a good impact of the extension efforts.

The second most important crop in both study groups is soybean. The SSP group also has a good production advantage here (Ref. 250kg; SSP 300kg). This may at first seem a little surprising, as SSP's extension program is focused on food and vegetable production first. But if one considers that the training was done by KVK officers, the result is not surprising. For KVK staff soya is the most widely grown crop and consequently the crop where they have most experience to offer. The production difference attains 20%. Therefore, it can be concluded that SSP farmers learned well in respect of this major cash crop. This could be seen as an indication that the gender dialogs within the families worked well. The contacts created through the women obviously also helped the men (who mainly cultivate the soya) to improved their relation to KVK to receive advice. The strong role of soya is also a consequence of the drought. Soya is a rather drought resistant crop and that is why it was sown so widely even among SSP farmers.

Next in importance of production comes wheat. This major staple crop was not part of particular extension efforts and this could be a reason why production levels in the reference group are better. Wheat is grown during the winter using the residual rain of the monsoon stored in the soil and besides some winter rains it also requires supplementary irrigation. Therefore, it can only be done on the better deeper soils with irrigation access. Several farmers explained that their area is not very suitable for wheat and that the main wheat production in the country comes from Punjab in the North. Beans and pulses play a very important role in the kitchen of Indians and this is also reflected in the production pattern in the study area. The biggest production comes from bengal gram also called chick pea. SSP extension included this crop and production levels indicate a 20% production advantage. Another important bean for nutrition is

pigeon pea and for this crop production in the SSP group is double compared to reference (Ref. 50kg; SSP 100kg).

**Table 19: Crop production data for most widely grown crops (medians)**

	No. of growers		Production kg per farm		Production Difference
	Reference	SSP	Reference	SSP	
<b>Grains</b>					
Sorghum	147	143	200	300	50%
Soy bean	126	129	250	300	20%
Wheat	46	73	150	100	0%
Bengal gram	89	116	80	100	0%
Pigeon Pea	47	57	50	100	100%
Cluster bean	11	41	22,5	25	11%
Black gram	43	78	30	20	-60%
Green gram	58	91	22,5	20	-50%
<b>Vegetables</b>					
Spinach/Palak	12	43	30	42,5	67%
Fenugreek/Methi	18	48	20	40	100%
Eggplant/Brinjal	13	46	50	40	-20%
Ladies Finger	12	38	26,5	25	4%
Coriander	17	44	15	20	0%
Chillies	10	42	15	20	67%
<b>Total</b>	<b>649</b>	<b>989</b>	<b>962</b>	<b>1153</b>	<b>20%</b>
Av.no. grain growers	71	91			
Av. no. vegetable growers	14	44			

Annotation: Data calculated for producers only (zeros excluded from computation).

Less important in terms of production levels are the lentils such as black and green gram where production just reaches up to 25kg and group differences are minor. These lentils are more difficult to produce and harvest and that may be the reason that they are not given so much priority. Lentils are an important part of the dhal soup, a must in the Indian cuisine.

Among the vegetables cultivated, most important are palack-spinach, fenugreek, eggplant, ladies finger, coriander and chillies. The production volume for each of the vegetables ranges from 15 to 50kg. If we take the total sum of quantities of vegetables produced, the SSP group again has a light advantage (Ref 172 kg; SSP 213kg).

Considering that vegetable production has been a major focus of extension work, at first sight this increase appears modest. However, again the effects of the drought on this result need to be recalled.

If we examine closer, the main success of the work of SSP is not primarily the fact that the productivity of vegetable production is improved, but the fact that vegetable production and consumption is made more popular in general. The most important difference between the two groups, and this applies to both grain and vegetable crops, is that in the SSP group many more farmers cultivate and produce crops. Out of the total of 200 reference group farmers only in between 10 to 18 produce any type of vegetables (5-9 %). In the SSP group vegetable growing has become much more widespread as 42-

48 farmers produce different vegetables. Therefore, depending on the type of vegetable, the number of growers increased in between 2 to 4 fold. If we further consider that traditional food habits are difficult to change, this is certainly a very good progress indication.

And it needs to be added that in years with better rains the number of vegetable grower is again much higher as the qualitative interview firmly indicated.

**Focus group discussions on the effects of the drought on yields**

Three focus group discussions on the effects of the drought showed that the yield reduction in 2015 was 83% for sorghum and 73% for soya compared to the year 2013 that had normal rains. This highlights the grave of shortfall in 2015. In many cases farmers didn't even sow in 2015 as the drought was just too strong.

Crop	Year	Group 1	Group 2	Group 3	Average
Sorghum kg/a	2013	300	260	200	253
	2015	100	16	10	42
Soya kg/a	2013	400	165	200	255
	2015	65	not sown	75	70
Yield reduction %	Sorghum				-83%
	Soya				-73%

The results of the group discussions indicate that in normal years the production levels are easily 3-4 times higher compared to the situation recorded with this survey. Thus, it can be expected that the benefits recorded for the SSP group would also be considerably higher, if the study had taken place in a year with normal rainfall.

Regarding a number of less frequently grown crops, SSP has also achieved a more than 3 fold increase in the number of farmers that started to cultivate these crops. In particular mentioned should be lin seed, sesame, maize and tomato. While in the reference group less than 10 farmers produce these crops, the number of growers for SSP reaches up to 20-30; for onions even 68. While the number of producers shows a very clear advantage for SSP, average production volumes for these minor vegetables indicate only a smaller advantage (5-8%). Cash crops such as sugar cane equally played only a minor role with limited numbers of growers in both groups (Ref. 8%; SSP 7%). More details on these minor crops are provided in Appendix 1, Table 54 see p. 119.

If we take the combined total grain and vegetable production for these major 14 crops shown in the table, then the SSP group has an advantage of 20% (Ref 1069kg; SSP 1283kg). This simple compilation shows that sustainable agriculture with a focus on food crops enhances the general productivity. Even in the condition of a double severe drought, the production system yields a higher and more diverse food production. Therefore, it may be concluded that if this system was promoted on a wider national scale, it could help to achieve a substantial improvement to fight nutrition related problems in India.

## Seed practice

### **Do you use your own seed?**

"Earlier before becoming a part of the SSP group we normally used to purchase bags of seeds and fertilizers from the market. With support of SSP our group was taken for an exposure visit where we encountered women farmers practicing local seed production. Since then, we have adopted the same practice and also each other. We also handling delicate seeds courses we learnt about germination testing. With able to maintain good the seeds better. We don't on buying seeds. But we



exchange or purchase seeds from demanded for further training on and safe storage of seeds. In these inoculation with Rhizobium and all that knowledge we are now quality healthy seeds and grade need to spend any more money also exchange a lot of seeds now.

In this way we help each other. If any other women farmer in the village – outside the farmers group possesses a new/unique seed, then we can buy from her and introduce this into our groups as well – so we make it available for all". Ms. Babita, Tirth village

"All our seeds are now our own. We cultivate three different varieties of sorghum and 5 different varieties of gram. We only buy seeds for wheat". Ms. Barkhabai Jadhav, Medsinga village

### **What new farming practices have you learned?**

In the women farmers group we share information about crops, land cultivation methods, new tool, new water saving irrigation methods and local seed production. There is a schedule of training and we visited demonstrations and shared the learning and best practices. We discuss the do's and don'ts with the group members during our regular meetings. Among us women we discuss about our produce and how to harvest, we talk about the challenges we face and look for solutions how to overcome the problems. So we have started many new practices. Very important is that we now grow our own seeds rather than buying them. We mark the good seeds already on field and harvest them separately. We share all the cultivation practices among our group members. To control crop pests we use bio pesticides such as Neem spray to the crops (Nimboli). We also add Neem leaves and powder to the dried seeds for better storage at home. FGD, Nature farmers club, Tirth village

### **What about growing vegetables? Which vegetables taste better?**

"The vegetables grown with our own seed taste better than the purchased vegetables. The food is very good for health. Consumption of our own vegetables has an advantage as it is fresh – fresher than the vegetables bought from the market – and you can only buy once a week from the market, while our own we can harvest daily from the garden". Ms. Archana Patil, farmer leader, Devshinga village  
Vegetables that we buy from the market are full of chemicals that are used to improve the shelf life and hence are not tasty. FGD, Devshinga village

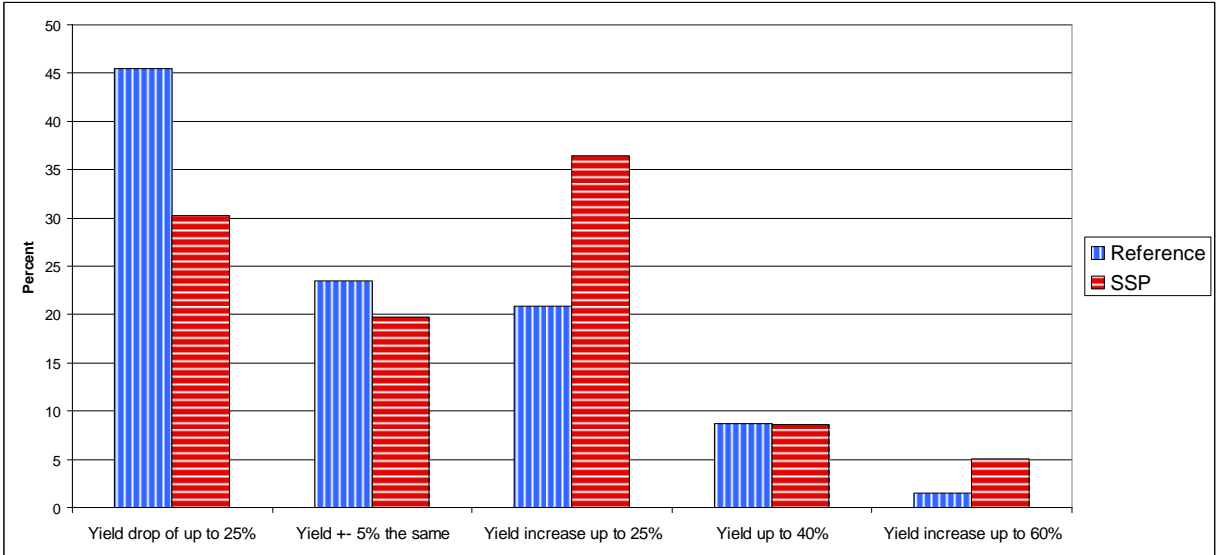
Due to the fact that the farm production is heavily affected by the drought, the research team also included a question on farm yields simply based on the qualitative assessment of farmers. These were asked to estimate the improvement of their crop yields in the last 10 years due to any kind of new farming technology that has become available and that they adopted (SSP extension messages, agricultural news, TV, radio, etc.). To exclude the effects of the drought on this question, the yield trend was to be rated up to the time before the current big drought (trend 2003 to 2013). The findings are presented in the next table.

The answers clearly point towards an impact of SSP's work. 35% of SSP farmers see a yield improvement of up to 25%, another 15% see even higher yield gains. In the reference group the number of farmers with yield advantages is considerably lower. The negative side of the coin is that we observe a big group of farmers without any



improvement. In the reference group 45% of farmers complain that their yields dropped and also in the SSP group 30% report this problem. This finding calls for a broadening and readjustment of extension messages. Many of the current messages are not or only partly relevant for some farmer groups. The point will be examined again in more detail later in this section.

**Figure 13: Farmers' view on crop yield improvement in the last 10 years**



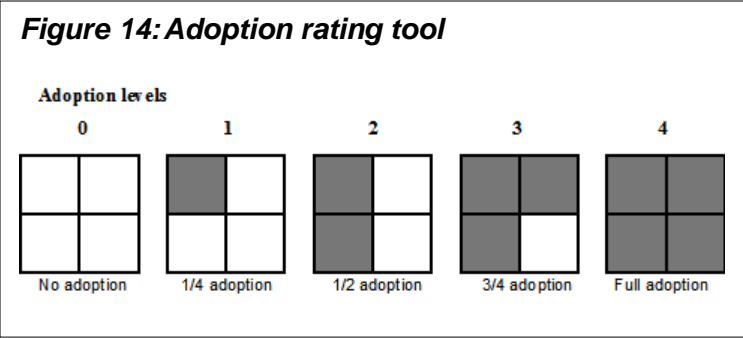
**Adoption of Sustainable Agriculture cropping practices**

The adoption of extension messages is a difficult matter to measure and the research team used a graphical tool to illustrate various levels of adoption. Farmers were first asked if they were trained on a given topic and then they were invited to rate themselves how well they applied the messages on their farm. Five categories ranging from zero adoption to full adoption were suggested.

SSP have conducted a wide range of trainings in collaboration with KVK officers and SSP farmers that acted as model farmers for others.

The training has been conducted successfully. On any of the key topics more than 90% of farmers confirmed that they were trained. The reference group also confirmed that they received training on some topics. On most topics the reference group was trained in between 30-50%. Only on rather general topics like intercropping even 73% indicated to have knowledge on the subject.

**Figure 14: Adoption rating tool**



**Table 20: Training reach out and adoption level for improved practices in percent**

Improved practices	Training %		Adoption %			
	Ref. %	SSP %	Reference		SSP	
			1/2	>=3/4	1/2	>=3/4
Intercropping/Mixed cropping	73	99	34	35	26	51
Germination testing	28	99	1	2	18	53
Soil testing	33	97	5	7	19	48
Seed inoculation	43	96	4	4	13	47
Utilisation of own seeds	63	99	38	44	31	47
Cultivation of food crops	54	98	22	23	19	42
Cultivation of vegetables	52	99	19	24	19	43
Cultivation of fodder	31	96	8	10	9	35
Biodynamic compost and vermi compost	41	91	10	10	8	33
Organic pest control	11	94	1	1	5	28
Farm bunding (entire farm)	8	90	1	2	10	19
Cultivation of Azolla	11	90	0	0	2	16
Cultivation of fodder (Hydroponics)	10	90	1	1	3	14

Training and adoption of content are two sides of the coin. This can also be seen here very clearly. If the assessment is done very strictly, and we look at full adoption only, then adoption levels range from 14% to 53%. However, if we consider that adoption needs some time and we look at the combined half to full adoption levels, than adoption ranges from about 40% to 80% for most practices. Considering that the project is still in the first phase, than these results can be rated as good.

One of the most important practices in farming is to maintain soil fertility by returning as many nutrients to the soil as possible. Both farming groups do this already to a good extend as can be seen by the fact 99% of farmers are using animal manure. Compost or biodynamic compost is applied by 16% in SSP and 10% of the reference group. The highly recommended vermicomposting is practically unknown for the reference group (0.5%) while it only starts spreading in the SSP group (12%). The same applies for mulching that is practised by a small group of early innovators in SSP (1.7%). The key constraint for mulching is generally that these materials are not sufficiently available. Several measures promoted were introduced to address the urgency of the drought crisis (azolla, hydroponic fodder). Azolla requires water and hydroponic fodder is rather expensive. This is why these measures did not really lead to large scale adoption. In normal years of rain azolla could work better, while hydroponic fodder is only interesting during drought crisis times.

The best impacts against drought have watershed measurements such as farm bunding. These measures, however, were outside the scope of funding for SSP. In India often the Government offers cash labour programmes such as MNREGA to promote for such watershed works. In some of the villages, such type of activities had been funded in the past.

### **Reasons for adoption and non-adoption given by farmers and focus groups**

The discussions on reasons for lower levels of adoption on some of the SSP topics proved difficult. Farmers considered their adoption high. Nevertheless, some few reasons for potentially low adoption were recorded:

- Number one constraint for vegetable production was seen in the severe drought of the last 2 years. Another reason was the marketing risks for vegetables and gluts in the market. The poorer farmers are afraid that they can't sell vegetable surpluses.
- Little farm land was seen as a key constraint. Some farmers may just have too little land to try innovations. Lack of irrigation was seen as another key production constraint. This limits adoption of vegetable growing to the monsoon period only. Hard hit are big families with many members that have little land to cultivate.
- "*Many farmers only stay at home for cultivation during the monsoon period but then they try to find other jobs outside. Temporary migration strategy is followed by many families*". Swolocha Patil, Chiwari Village.
- Lack of livestock is seen as a constraint to implement proper organic fertilization. The possibilities to purchase farm yard manure are limited.
- Women headed families are seen as another group that may have low income and thus difficulty to implement some of the recommendations.
- Low off-farm income is seen as another reason why farmers may lack funds to invest.
- Hydroponic fodder is not adopted as farmers may have other cheaper fodder available to feed their animals.
- Vermicomposting is seen as too labour intensive with too little extra benefit compared to just doing ordinary farm yard manure.
- Low adoption on some topics is seen simply as a lack of awareness: Not all farmers attended all trainings and consequently some missed out on some topics. *FGD Ansurda village*

In order to promote ecological farming practices, SSP can still upgrade its portfolio of support measures to farmers. Some highly effective measures are for example:

- ☒ Promotion of small ruminants to assist in particular poor farmers and promote the production of more organic manure,
- ☒ Construction of improved animal sheds for improved manure recovery,
- ☒ Construction of animal urine tanks,
- ☒ Agroforestry with fruit trees
- ☒ Fodder/green manure trees on farm bunds,
- ☒ Biodiversity training with focus on seed variety exchange and farmer led breeding,
- ☒ Drought resistant varieties for all crops cultivated
- ☒ Farm bunding and other water retention measures.

Some useful books on sustainable agriculture are listed in the following footnote<sup>32</sup>.

The necessary reorientation of measures will be discussed further in the recommendations chapter.

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<sup>32</sup> • IIRR (1998): Sustainable Agriculture extension manual for Eastern and Southern Africa. Nairobi. This is a classical book by IIRR and it is also fully suitable for farming conditions in India.  
• Desai, B.K. and B.T.Pujari (2014): Sustainable Agriculture: A Vision for Future. New India Publishing. A recent Indian textbook on the subject.  
• FAO (2015): Training manual for organic agriculture. Rome. [www.fao.org/fileadmin/templates/nr/sustainability\\_pathways/docs/Compilation\\_techniques\\_organic\\_agriculture\\_rev.pdf](http://www.fao.org/fileadmin/templates/nr/sustainability_pathways/docs/Compilation_techniques_organic_agriculture_rev.pdf) [accessed 13.6.2017]. A recent FAO manual with examples throughout the world

### **Use of farm inputs**

Organic materials as inputs to ensure good soil fertility play a central role in sustainable farming concepts. SSP has been promoting a broad range of organic fertilizers: animal manure, composting and vermicompost just to name some measures. The promotion of animal manure can be rated as successful to some extent as the data in the next table shows.

The application of farmyard manure is statistically significantly higher on SSP farms compared to the reference group. The analysis of percentiles shows that there are considerable differences in application rates among SSP farmers. In the upper percentile P90 farmers manage to apply more than 6 tons per ha while the average farmer (P50) in SSP just apply 1.0 tons. In P25 the application rate drops to 500 kg and in both P10 groups farmers do not apply farm yard manure. The respective application rates for reference group farmers are typically 100-150kg lower in most classes.

**Table 21: Production and application of farm yard manure in percentiles kg/ha (acre)**

<b>Percentiles</b>	<b>Reference kg/ha (acre)</b>	<b>SSP kg/ha (acre)</b>
P10	0	0
P25	910 (364)	1250 (500)
P50	2223* (889)	2500* (1000)
P90	6250 (2.500)	6250 (2500)

\*) Differences are significant. UAV test: Sig 0.046

While the application rates for the P90 group are very good and may result in increased soil fertility, the application rate for average farmers is probably just sufficient to keep up soil fertility. In the P25 and below it may be assumed that soil fertility is declining slowly over the years. This is in particular the case as fallow periods are no longer available to maintain soil fertility. The exact long-term effects on soil fertility are difficult to determine and depend on many factors: type and frequency of tillage, rainfall, application of organic manure, application of chemical manure, green manure crops in the rotation and soil type.

A good indication for soil fertility is the content of organic carbon in the soil. Information from KVK in the study region indicated that most soils now have a soil carbon content of 0.35 to 0.45%. This is a low value. Patil et. al. (2014) found that in the conversion of forest to farmland the carbon content drops from above 50 t/ha in the top 30cm soil layer to just above 10 t/ha for selected soils in Maharashtra over a period of 50 to 100 years. Bhattacharyya et. al (2004) state that irrespective of the initial carbon level of soils, there is a tendency of soils to reach a quasi-equilibrium which has been reported 0.5 to 0.8 per cent in black soils of central India. The study region is also characterized by black soils. Thus, the current C levels found in the study region of Osmanabad are already below the above guideline. Müller-Sämman (1985) recommends in GTZ's key reference manual for sustainable agriculture a range of 0.6 to 1.2% as desirable C content. This highlights that current soil organic levels are already considerably below suitable standards<sup>33</sup>.

The data indicates that SSP has made a first beginning to reverse the negative trend on soil fertility. Considering the long term nature of changing soil properties, it will require

<sup>33</sup> It is not possible to raise soil organic matter in the short duration of a few years. It would already be an advancement if soil organic matter does not drop further. Srinivasarao et. al 2011 conclude in the Journal of land degradation and development that even over a period of 18 years it was not possible to raise C levels in trials with high level of organic and chemical fertilizer input on Entisols in Western India.

that farmers follow-up recommendations on good soil fertility maintenance very carefully over many more years. Considering that animal manure is the most important fertilizer, it will be important to convince farmers that do not have livestock so far, to take up some livestock rearing as well. This is not so easy, as livestock require permanent attention, and this reduces chances for other alternative employments.

The use of chemical fertilizer in India has become widespread in particular since its massive promotion in the green revolution. However, this general trend for India is only partly true for the study area. Due to the drought, most farmers did not apply any fertilizer or less than usual. Depending on the most frequent chemical fertilizer types the percentage of farmers that didn't use any ranged from (65-96%) in both groups. Most popular are Urea and DAP that are used by up to 35% of farmers, while Single Super Phosphate and NPK are used by only up to 12% of farmers. The application rates ranged from 50 to 70 kg per acre and the rates for SSP farmers were generally some 5-15kg lower for most types of fertilizers (see table).

**Table 22: Total income and average fertilizer application (kg/acre) by percentage of farmer users**

		Low <= 115,700 Rs.		Medium 115,700 - 209,500 Rs.		High >= 209,500 Rs.	
		Reference	SSP	Reference	SSP	Reference	SSP
NPK	Kg/acre	54,2	85,9	58,5	52,7	82,4	74,2
	%	6	4	8	11	4,5	11,5
Single super Phosphate	Kg/acre	69,11	28,9	79,7	40,5	84,4	63,9
	%	4,5	1,5	2,5	7	4,5	9
DAP	Kg/acre	71,5	66,8	55	54	94,1	77,9
	%	35	22,5	27,5	27	23	32,5
Urea	Kg/acre	60,1	58,2	68,2	54,9	71,8	57,1
	%	27,5	20	25	25,5	21,5	30

It is interesting to note that income level of farmers showed only a rather small influence on fertilizer application rates. The correlation between total income and fertilizer use for Urea was very weak (R of 0.016; 1.6%) and was not supported statistically (p. 0.789).

The above table shows that most farmers respect SSP's recommendation not to use chemical fertilizer and this practice seems even more common in the reference group. However, considering the weak utility of chemical inputs, it should be more easily possible to convince farmers to switch to organic manures. This is also what many farmers stated during the focus group discussions. After a sceptical first year, they quickly adopt the new practice; in as far as alternative manures are available.

☒ And the limited availability of organic manures is the key constraint that requires more attention and focus of extension in the future. This result calls for further emphasis on using composts and on green manure with agroforestry trees as an alternative way of crop fertilization.

Regarding the use of herbicides and pesticides, the efforts of SSP to promote organic practices are not very visible as yet. In both farming groups the use of insecticides is

very common (84%). However, a good practice of sustainable agriculture, hand weeding, is still practiced by practically all farmers in both groups (99%). Nevertheless, hand weeding is a very tiring activity, and so it is no wonder that the practice of using herbicides is getting more common on all farms.

**Table 23: Use of herbicides and pesticides and respective farm spending (Rs.)**

<b>Practices</b>	<b>Reference</b>	<b>SSP</b>
<b>Weed control</b>		
Hand weeding % of farmers	99.5%	99.0%
Chemical herbicide % of farmers	34.0%	38.7%
<b>Pest control</b>		
Organic pesticides	4.1%	24.5%
Chemical pesticide	84.1%	84.0%
Trap crops	25.1%	32.0%
<b>Other investments</b>		
Spending on herbicide	1,707 Rs.	2,851 Rs.
Spending pesticides (insecticide, fungicide, etc.)	1,547 Rs.	1,933 Rs.
Spending seed and planting material	5,625 Rs.	5,464 Rs.
Livestock feeds and medicines	6,123 Rs.	7,767 Rs.

The farmer interviews showed further that SSP farmers produce the food for home consumption without chemical sprays, but the proportion destined for the market is sprayed. Thus, farmers prefer the organic practice for their own food, but for the production for the market they prefer the convenience offered through the help of chemicals. Considering that so far no premium prices for organic foods are achievable in the rural areas, it is well comprehensibly, that farmers proceed in this way.

Nevertheless, organic remedies to control pests are showing an encouraging take up in the SSP group (25% against Ref 4%) and also trap crops are advancing well among SSP farmers (SSP 32%; Ref 25%).

The amounts spent on herbicides and pesticides do not show big differences between the groups and in relation to total farming costs they only account for 4-5% of total costs. This shows that chemical application is still very small scale. Other input costs such as seeds and planting materials show that SSP farmers spend a little less due to their focus on own seed preparation. A good sign is also that SSP farmers invest more on feeds and medicines for livestock.

The inventory of farm implements shows that most farmers are still very poor and do not own any machinery or implements (70-80%). Only 2-3% of farmers owned major equipment such as tractors or threshers. Even bull carts are rather rare (17-19%). The differences between the two study groups are very small. The major difference is that SSP farmers have more livestock and thus also own more stables for cows.

**Table 24: Major farm implements**

	Reference %	SSP %
<b>Farm assets</b>		
Stable for cows	22.7	32.7
Seed or fertilizer drill	22.2	20.9
Plough	19.7	22.5
Sprayer	17.7	22.5
Bullock cart	16.7	19.4
Stable for goats	6.1	7.7
Thresher	3.0	0.0
Poultry shed	3.0	2.6
Tractor	2.0	0.0
Farm storage structure	2.0	2.6

### 4.3 Livestock production and extension system

Livestock ownership shows a much skewed distribution. The majority of farmers (50-80%) in both groups do not own any animals at all. If we look at the percentage of SSP farmers with at least one dairy cow (SSP 28%; Ref. 17%) we see a little advantage. Similar the percentage of farmers with at least one oxen is higher (SSP 12%; Ref. 7%). Likewise the percentage of SSP farmers that own 3 or more goats is a little higher compared to the reference group.

Overall, the differences in livestock between the two groups are small, and the statistical tests did not support any differences.

**Table 25: Number of livestock per farmer in 2015**

No. animals	Oxen		Dairy cows		Goats	
	Reference %	SSP %	Reference %	SSP %	Reference %	SSP %
0	60,2	52,7	71,5	59,0	86,5	82,5
1	6,6	11,5	17,0	27,5	5,5	3,0
2	28,3	29,7	7,5	9,5	2,0	3,0
3+	4,8	6,0	4,0	4,0	6,0	11,0

Livestock ownership before the project intervention in 2010 and 2015 shows a little increase on the means for 2015, but once again, these small differences are not statistically significant (see appendix 1, Table 64, p. 124).

A major difference was recorded in respect of milk production. Here the SSP farmers have a clear advantage and produce almost twice as much milk (1129\* L) compared to the reference group (629\* L). This difference was found significant (sig. p 0.047). Milk production is often a business that is taken up by farmers that take a leadership role in SSP's work. Typically, these farmers have 1-2 milking cows. A milk production of above 1000L in a very dry year in semi-arid conditions is a quite good production level. Dairy production might be an area for further promotion as there is a ready market for milk products. Even conditions for dairy goat production might be worth exploring.

#### Views on livestock

We also explore and adopt other livelihood opportunities like the sale of surplus vegetables, poultry, dairy, cattle rearing etc. Thanks to the dairy farming we can consume more milk, sell more milk and the cow dung is useful in the farm as manure. We try to increase in the number of cows and cattle and this lead to an increased demand for fodder. So we now cultivate more fodder crops. We divide up land, some we give to fodder according to the no. of livestock and then the remaining land is for the crop cultivation. *FGD, Nature farmers club, Tirth village*

*"I also rear hens to sell the eggs and the manure. I feed the birds with leftovers but also with foodstuff distributed through governmental programs (wheat)". Ms. Nanda Garad. Ansurela Village*

*"I have increased the number of animals – now I own 2 bullocks, 1 cow and 2 buffalos". Surekha Kanade, comments during the evaluation workshop.*



*Picture 1: Ms. Archana Patil, raising a special black poultry race with highly nutritious eggs, Devshinga village*



- ☒ Due to the general shortage of fodder, SSP should promote more zero-grazing fodder systems and encourage the cultivation of agroforestry fodder trees. This can make better use of scarce farm land with good synergy for soil fertility and income diversification.

### **Extension system**

The comparison of the frequency of service delivery to farmers shows that SSP provided regular monthly services to farmers. This is confirmed by 98% of farmers. Other NGO services to farmers are rare. 64% of respondents in both groups stated that they do not get any other agricultural service in their village. But even Government services are scarce. 45% of reference group farmers stated that they never get any Government agricultural services. 22-26% of both groups rated that Government services are available on quarterly basis. The next table shows the frequency of extension service to farmers in overview.

**Table 26: Percentage of farmers getting regular extension by different providers**

Frequency	SSP extension		Other NGOs		Government services	
	Reference %	SSP %	Reference %	SSP %	Reference %	SSP %
Never	45	1	64	64	45	34
Once in 2 years	0	0	9	5	2	4
Once a year	0	0	8	6	15	15
Twice a year	2	0	3	4	7	16
Quarterly	1	1	4	7	26	22
Monthly or more	53	98	13	14	7	10

Most households are very happy with the extension services received through SSP. 57% of SSP farmers rated the quality of service as very good and even 31% rated the service as excellent. Even among the reference group, SSP is well known as a service provider.

The quality of Government extension services is rated higher by SSP farmers compared to the reference group. During the focus group discussions, many of the women supported by SSP indicated that they can now access many different types of government services, not only the agricultural services. The quality of these direct Government services is not rated as high as the SSP services.

**Table 27: Farmers rating of the quality of extension services received**

Quality	SSP extension		Other NGOs		Government services	
	Reference %	SSP %	Reference %	SSP %	Reference %	SSP %
Excellent	8	31	3	2	1	0
Very good	39	57	8	8	9	9
Good	6	11	11	11	18	28
Medium	3	0	4	8	27	28
Fair	1	0	13	10	2	1
n.a.	44	1	62	61	45	34

Extension service is certainly one of the key impact areas of SSP's work. In particular the approach to bring in Government as an additional partner has helped to give farmers a better service provision.

In this respect SSP has generated a win-win situation for all sides. The talks of the consultants with KVK staff confirmed this very good partnership.

- ☒ Considering that SSP is still rather new in providing agricultural services, it should consider broadening its knowledge base by collaborating more with experienced actors in the organic movement in India.

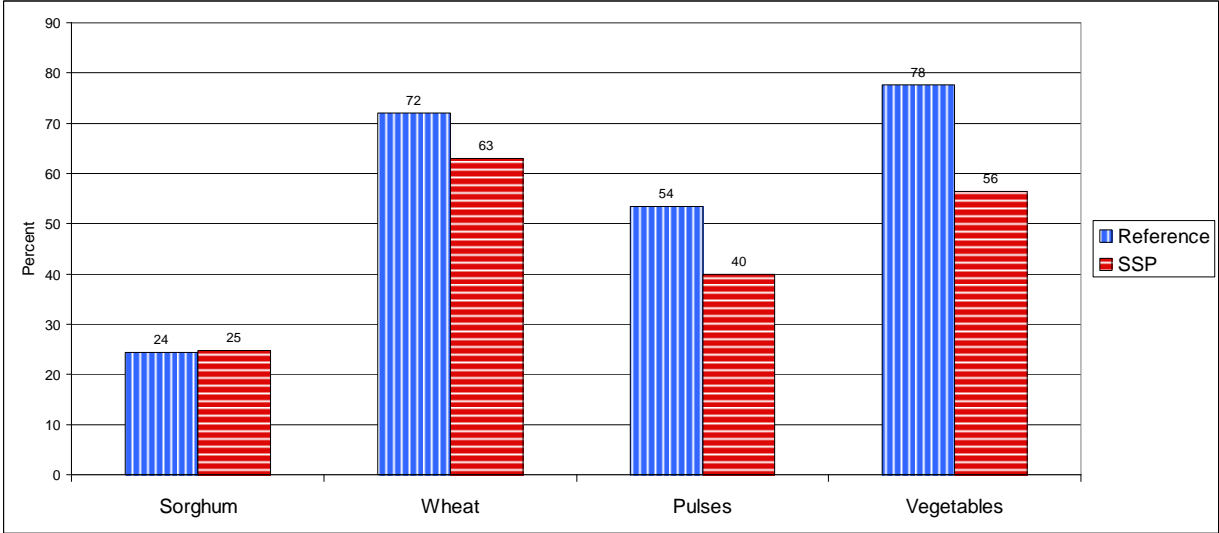
### 4.4 Food security, diet and health

Today’s food and farming systems have succeeded in supplying large volumes of foods to global markets, but are generating negative outcomes on multiple fronts: widespread degradation of land, water and ecosystems; high GHG emissions; biodiversity losses; persistent hunger and micro-nutrient deficiencies alongside the rapid rise of obesity and diet-related diseases; and livelihood stresses for farmers around the world (IPES-Food 2016). These crescent problems diagnosed by the International Panel of Experts on Sustainable Food Systems are also confirmed by the current study for the study region.

A range of different methods were used to analyse the food security status of farm households. The first instrument is a self ranking seasonal diagram where the respondents were asked to rate their food self sufficiency based on own crop production using a scale with 5 grades ranging from 0%, 25%, 50%, 75% up to 100%. The information of this tool will be cross-checked with the households' responses on crop production in kg for home consumption that will be presented later in this section. Finally, we compare the consumption of the households with the recommendations for a healthy nutrition.

We begin with households that do not have any own farm production and consequently have to buy all food from the market. In times of financial difficulty, these households might become food insecure. In the reference group the percentage of households that need to buy everything is very high, for wheat 72%, for pulses 54% and for vegetables 78%. SSP farmers are doing in between 9-18% better for these crops. Sorghum is the major staple crop for the farmers in the study region, and the supply situation is much better, only a quarter of farmers in both groups need to purchase this cereal. This result shows that SSP has helped in particular to reduce the number of families that have to buy all food in particular for pulses and vegetables.

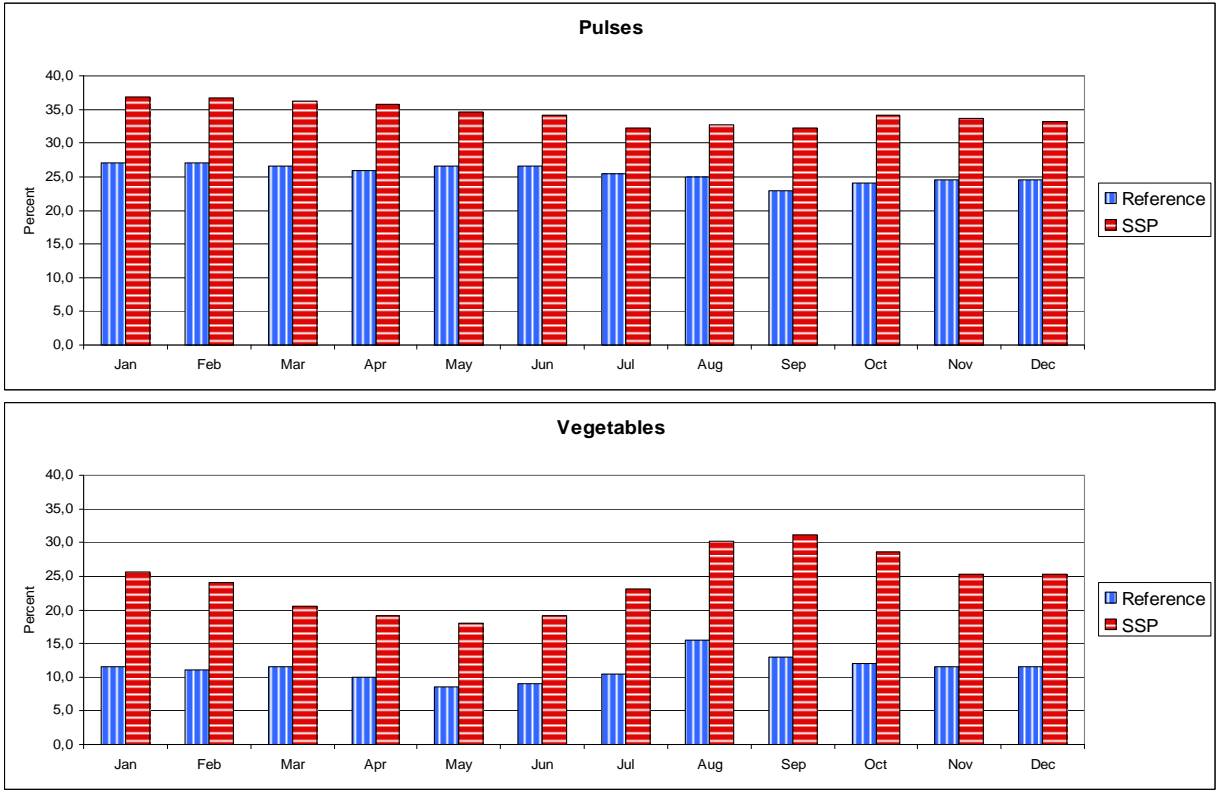
**Figure 15: Percent of households that purchase all food from the market**



Next we take a look at the percentage of households that are fully food secure and produce all food needed on their farm. For the main staple sorghum this is the case for 67% of SSP farmers and 64% in the reference group. For wheat the percentage of farmers with full self sufficiency is much

lower (SSP 23%; Ref 18%)<sup>34</sup>. These differences are statistically highly significant\*\* (p= 0.09, update). In the course of the year the level of self sufficiency is almost constant. The percentage of farmers with full self sufficiency on vegetables and pulses is shown in the next chart.

**Figure 16: Percentage of farmers who fully covered their food needs by own production for pulses and vegetables**



25% to 30% of SSP farmers have this full self-sufficiency throughout the year. The advantage over the reference group is about 13% points for most months of the year. For pulses the situation is best in January to February and for vegetables during the monsoon in August to September.

Another interesting finding is that farmers preferred to produce a crop with the aim of full self-sufficiency rather than small productions for partial self-sufficiency. This is demonstrated by the fact that the group of farmers that achieved such a partial self-sufficiency in the range of 1/4 to 3/4 self-sufficiency was only around 10% for each of the four crops examined. For this reason, these results are not displayed here.

The data very clearly indicates an impact of the work of SSP. The recorded differences are as yet not very large, but a start is made and over time it may be anticipated that adoption levels can be improved further. As mentioned before, the drought certainly has a strong influence on these results. Due to the lack of water, in particular the vegetable production probably suffered most.

<sup>34</sup> Farmers indicated as an explanation that the soils are not so suitable for wheat. India's main production area of wheat is the Punjab. It may be that wheat from Punjab is cheaper and makes the wheat production less interesting in Maharashtra.

## Peoples' views on food security

### **Is your food security better today?**

"Yes eating has improved a lot. We have enough of pulses and vegetables all year round". Ms. Barkhabai Jadhav, Medsinga village.

As we use own seeds and own manures, food produced in our farm is far cheaper than what we buy from outside. Also, when we sell produce in the market, owing to increased supply, the price decreases. By the time we go to the market to buy the produce, demand for the produce is more than supply and hence it is costly. So we eat much more of our own food now. FGD, Devshinga village

Better food security also comes from the fact that farmers depend less on the public food distribution (PDS) system. In the group, the women rate the situation today as follows:

Families relying on subsidies food	Reference farmers	SSP farmers
Reliance on PDS	50%	25%
Self Sufficient (own food)	50%	75%

FGD, Tirth village

### **How do you define "good food"?**

There must be roti and rice. Vegetables and milk are very important because they are rich in proteins and vitamins. We now get good food. FGD, Tirth village

But also on wheat or pulses, the results are behind expectations. The fact that these crops are readily available in the market at rather low prices, may also contribute to the fact that many farmers refrained from producing them on their own.

Now we compare the before shown farmers' self-rating estimates with the production figures of the households. The computation on the food consumed per person leads to similar conclusions as the self-ranking estimates.

The computations on food consumption were carried out in a very comprehensive way. During the discussions with the households, the food consumption was determined for all household members per year.

As the respondents didn't have a clear idea on total annual food consumption, a weekly food consumption pattern was elaborated first, and this weekly consumption was multiplied by 52 weeks to establish the annual consumption estimate

The computation is done according to the following basic formula<sup>35</sup>:

$$\text{Food intake per person} = (\text{Consumptive own production} + \text{consumptive purchased}) / \text{age and gender corrected person units}$$

The computation is done for each household separately by taking into account the specific house hold food production and food purchases. This total consumption per household is divided by the exact number of persons per household. In order to account for the different food requirements of women and men, children and elderly, the specific

<sup>35</sup> A few limitations of the data should be mentioned beforehand. It is difficult for people to remember the production for a full year. Considering that the food consumption is not even throughout the year there can be a certain level of error by just up-scaling consumption based on a single week. This problem is also known well from nutrition studies conducted in Germany that show stronger variation for household consumption data (Strassburg 2010). For best results daily food protocols for a period of 2 weeks or longer would be needed. However, such level of precision on nutrition cannot be achieved for a mixed study on farming and income.

Indian food consumption recommendations issued by the National Institute for Nutrition in Hyderabad, India were used for computations. These food intake recommendations permitted to calculate an energy corrected person unit for adjust for the comparison of all household.

**Table 28: Energy intake according to gender and age categories**

Age groups	Kcal/day	Energy corrected person units
Man	2730	1,10
Woman	2230	0,90
Children 0-5	1205	0,49
Children 6-10	1690	0,68
Boys 11-14	2470	1,00
Girls 11-14	2170	0,88
Youth male 15-25	3020	1,22
Youth female 15-24	2440	0,98
Elderly male >65	2500	1,01
Elderly female >65	1900	0,77

Source: National Institute of Nutrition Hyderabad (2011)

For a healthy nutrition, the National Institute of Nutrition recommends to consume the following quantities of food items per year per person:

**Table 29: Recommended food items in kg per person and year**

	Recommendation Kg annum
Cereals & Millets (Kg)	149
Pulses and non-veg food	30
Milk (Lit)	100
Vegetables (Kg)	100
Fruits (Kg)	33

Source: National Institute of Nutrition Hyderabad (2011)

The results of the nutritional computations is provided in Table 30, p.79. The data shows a broad variation, with on the one hand side low food intake for the poorer households and on the other side high food intake for the better-off households. Consequently, the simple presentation of average food intake would not provide a useful picture. Instead of the means, the median food consumption is presented. This figure gives an unbiased account a typical average consumption. In addition, the food consumption of a better-off household with higher consumption level (P75) is provided in the following table.

The results show very clearly that income level of the household has a strong influence on the amounts of food consumed. At median level, food consumption falls considerably below the recommendations given by the National Institute of Nutrition. SSP farmers consume 106kg of cereals against the recommendation of 149 kg (-29%). For pulses the shortfall is bigger with a consumption of 18kg against the recommendation of 30kg (-40%). Milk consumption is 37L against 100L recommendation. For vegetables the situation is best with a lower deficit 82kg consumption against 100kg (-18%). For each of the above items, the SSP group is doing some 5-15% better than the reference group. Thus, the calculations indicate a very

similar advantage of SSP farmers as already shown by the self-ranking presented earlier and as shown by in the crop production section (+20% production).

**Table 30: Total food consumption per person unit in kg and held against nutritional requirements in kg and nutritional requirements in percent (brackets)**

	Recommended annual <sup>1)</sup> consumption kg	Median household (P50)		Better-off household (P75)	
		Ref. kg (%)	SSP kg (%)	Ref. kg (%)	SSP kg (%)
Cereals & Millets (Kg)	149	98 (66)	106 (71)	174 (117)	207 (139)
Pulses and non-veg food	30	11 (37)	18 (60)	27 (90)	34 (113)
Milk (Lit)	100	43 (43)	37 (37)	115 (115)	112 (112)
Vegetables (Kg)	100	72 (72)	82 (82)	111 (111)	152 (152)

Source: <sup>1)</sup> National Institute of Nutrition Hyderabad (2011)

While the food intake of the average households seems to be considerably below requirements, the food intake of the better-off households (P75) for the SSP group is substantially above the food requirements (cereals 139%, pulses 113%, milk 115%, and vegetables 152%). In the group of the better-off the differences in consumption between SSP and reference group are smaller, but also show clear advantages for pulses and vegetables.

On the opposite side, consumption levels among the poorer households (P25) are not shown here, as the figures appear as unrealistically low (e.g. total cereal consumption of only 55kg against a need of 149kg)<sup>36</sup>.

These results show very clearly that India suffers from two trends conferred in various publications of united nations organisations and the international panel on sustainable food systems: The problem of undernourishment persists in particular among poor households, while problems related to oversupply of nutrients (obesity, diabetes, etc.) increasingly become a problem for the population with higher income (FAO 2010; UNEP 2016, IPES-Food 2016). The current food calculations of this study confirm exactly this problematic situation, undersupply of food on the side of the poor and oversupply of food for the "better-off" among the poor population. It should be noted here, that the term "better-off" could be misunderstood. The "better off" are the farmers with 2.5 acres or simply higher good off-farm income sources, while the poorer households are those with an acre or less of land and insufficient off-farm income sources. Consequently, "eating wrongly", either as simply too little food or too much of unhealthy food is a complex problem that requires nutritional education besides better farming practices. SSP has tried to move into both these directions by giving advice on farming and also on better nutrition by focusing on women. The data shows that a medium level impact for better food supply could be achieved. The qualitative discussions also indicate a good level of nutritional behaviour change (see the next box "focus group discussion on malnutrition").

<sup>36</sup> It is not possible to sustain a living on such low food intake levels. As was indicated in the methodology section, it seems very likely that the poorer households on purpose provided understated production and income figures, as they may have expected to benefit from any project or Government related relief funds.

## **Focus group discussions on malnutrition and quality of health services**

***According to recent survey, 20- 30% of people from India are malnourished. Are there families who are malnourished or those who go hungry here in your village?***

I would say so yes. There are people who cannot afford to eat all food categories and hence consume cereals and pulses only. But this doesn't apply to us in the SSP group. Our own produce includes wheat, sorghum, pulses and vegetables. So we have all that is needed. We even sell additional produce at the village level so as to make it available for land less households as well. We also buy from Public Distribution System and hence there is always enough food available. *FGD, Devshinga village.*

***How was the nutrition within your village before you started working with SSP?***

General food problems were: There is shortage of millets. Vegetables can be bought only once a week on the market. So vegetables are not fresh. A family with less than 3 acres has too little own food for consumption. All that have cash can always buy all they need. Nobody gets hungry if you have money. Babies were given sufficient milk and also breast milk was given sufficiently. Young boys and youth also got enough food. Men always get most food as they eat first. Young girls were given less food. Also women get too little because they eat last. Often mothers in law punished the young women if they attempted to eat extra amounts. *FGD Keshegaon village.*

***What has changed since you work with SSP?***

The quality of food is now better we have more fresh vegetables and pulses in monsoon period. Now we always have enough food. All family members get enough food and in particular the young girls too. What helped most to solve the problem:

- Eat something after hours when husband are not there
- More irrigation facilities, higher off-farm income to buy other food
- More fast foods available today to take a quick bite
- Less male domination. *FGD Keshegaon village.*

***What are your future plans? What do you want to improve further?***

We want to adopt organic practice on even more land and gradually reach out to the whole land eventually. We want to improve on local seed production more, and expand on the diversification of crops. We want to promote health and nutrition awareness among the women in our area. *FGD, Devshinga village.*

***How is the health of your family?***

*"I have tested my haemoglobin levels several times. After six months it has improved a lot. All the family members, the girls and also the elderly, they all have better health now due to better eating. Everybody is very happy because the food is much tastier and fresher". Ms. Vanitha Balbhim Memshti, Chiwari village.*

The women discuss the progress on food and health in their group. All agree that food is much better. On the health situation, it is not fully the same. Still most say that also health is improved. They explain that there are health problems that are not affected by food. These health problems still persist and also some accidents happen that lead to health problems that need to be overcome. But they have easier access to health services also through SSP. There are the SSP health volunteers that help to link up with good doctors and the government health system. *FGD, Masala village.*

***Do you have a joint health mobility or insurance card?***

*"No we don't have any health insurance. If somebody needs to go to hospital, then the SHG helps. The SHG sponsors money for hospitalizations". Ms. Rukmini Hajgude, Kini village.*

***What is the long term trend in India for health and education (think of the last 20 years)?***

*"Yes the situation has generally improved in both ways; health and education are better today". Ms. Vanitha Balbhim Memshti, Chiwari village.*



While the qualitative interviews also show a good progress on nutritional behaviour, the quantitative data in this respect only show a rather minor progress so far. The households were asked to state what foods they eat more or less compared to five years ago (see Appendix 1, Table 60. p.122 ). The findings highlight that 7% of SSP farmers eat more millets, 3% eat both more dairy products and also more vegetables. On other food items the changes of diet compared to before the project intervention only range from 1-2% and also the differences between SSP farmers and the reference group remain in the same limited range. The differences between qualitative and quantitative finding remains difficult to explain. The drought might again have played a certain role forcing the households back to a more basic diet for the last 2 years. During the evaluation workshop, several women confirmed that now since the monsoon arrived, food habits change again strongly, as many now can eat vegetables again.

Concluding the chapter on food security, we take a first look at the value of the food produced and consumed in the households. This showed a substantial advantage of the SSP group compared to the reference group. At median level the value is 67% higher compared to reference group.

**Table 31: Total value of all farm produce (food, fodder, seeds, livestock etc) Rs.**

	Low income	Median income	High income
Percentile	P10	P50	P90
Reference	4,305	18,333** a)	54,080
SSP	7,150	30,553 **a)	57,371
Advantage SSP/Ref %	66%	67%	6%

a) UAV test: Sig 0.003;

At first sight, this finding may appear as an error. Considering that the level of home consumption is physically only about 20% higher, why should the value of the food be so much better? The explanation must be seen in the fact that a strong focus of the programme has been on vegetables and milk production. These commodities have much better prices than staple foods like sorghum, millet or pulses. These shows, that even with rather small amounts of food, the SSP households achieve a good additional income, as they do not have to buy these commodities from the market. This benefit is also fully visible in the low income segment. In this respect the strategy can be seen as a very good instrument of poverty reduction, a central goal of Misereor and also of German development cooperation.

## 4.5 Economic situation of the households

Poverty reduction and raising poor household's incomes is one of the most important international development goals. Investigating the income situation was also one of the key tasks of this study. Due to the fact that income shows a broad stronger variation, the study presents the average income based on the medians and in addition upper and lower income sections are shown through percentiles (P10, P25 or P75 and P90).

The income analysis for households in the study region shows the typical wide variation of incomes. If we take total income including the value of subsistence food produced, it ranges from as low as 78,156 Rs. (P10) to 422,973 Rs. (P90) in the SSP group (see Table 32). The median income lies at 172,200 Rs (2,315 €) for SSP farmers and at 135,780 Rs (1,826 €) for reference group farmers. These differences are statistically highly significant \*\* (p 0.003).

**Table 32: Overview on gross income in (Rs.)**

	Low income	Median	High income
Percentile	P10	P50	P90
<b>Off-farm income</b>			
Reference	12,000	<b>79,400</b>	220,000
SSP	14,500	<b>80,000</b>	203,000
SSP/Ref %	21%	<b>1%</b>	-8%
<b>Value home consumption</b>			
Reference	4,305	<b>18,333** a)</b>	54,080
SSP	7,150	<b>30,553 **a)</b>	57,371
+SSP/Ref %	66%	<b>67%</b>	6%
<b>Gross farm income</b>			
Reference	1,500	<b>26,500* b)</b>	124,000
SSP	8,525	<b>47,400* b)</b>	175,000
+SSP/Ref %	468%	<b>79%</b>	41%
<b>Grand total income (incl. consumption)</b>			
Reference	<b>59,700</b>	<b>135,780** c)</b>	<b>368,880</b>
SSP	<b>78,156</b>	<b>172,200** c)</b>	<b>422,973</b>
+SSP/Ref %	31%	<b>27%</b>	15%

a) UAV test: Sig 0.003; b) UAV test: Sig 0.033; c) UAV test: Sig 0.003

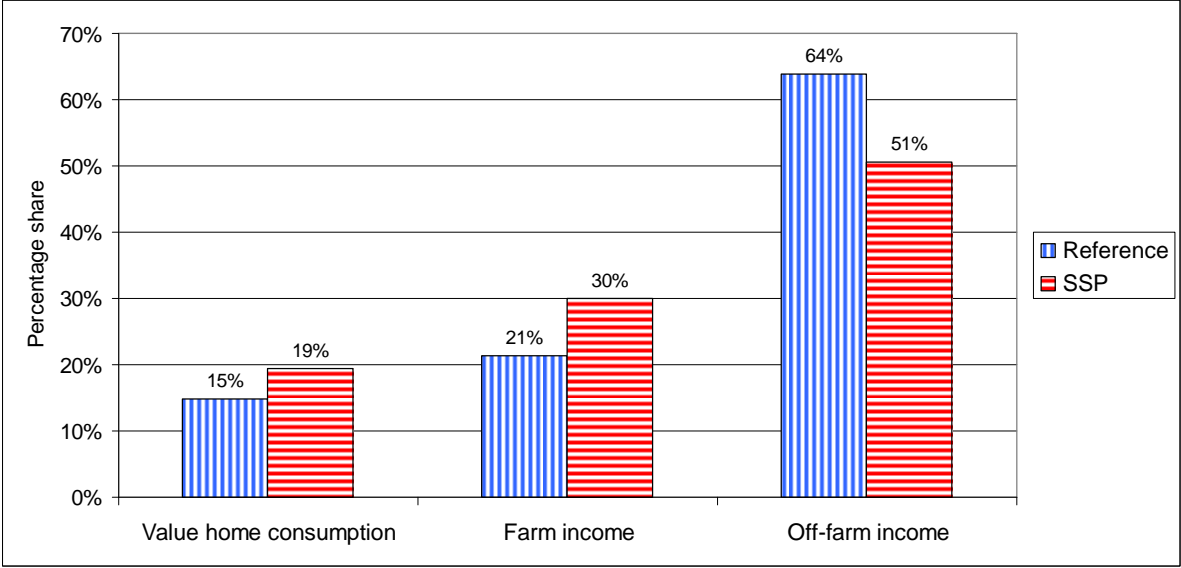
This highlights a substantial impact. Even under the very difficult framework condition of two years of consecutive drought, SSP has managed to improve incomes by 27% on median level.

If we look at the income derived from farming, we see that the value of food consumed by the family constitutes about 1/6 of total income and reaches 30,553 Rs. at median level for SSP farmers. If we use the values of the reference as the baseline (=100%), then the difference to the SSP group expressed in percent indicates a 67% advantage. This additional value of food makes a major contribution for a better nutrition of the whole family. Also farm income is more than three quarters higher (79%) in the SSP group. This highlights that SSP's intervention strategy worked well to increase food production and raise agricultural income.

The major source of cash income, for both groups, however, is off-farm income, and here the income level is practically identical around 80.000 Rs (1,075 €) for both groups.

This finding highlights that rural farm families need to depend on various sources of income for their livelihood, and due to the low prices for farm produce combined with low production volumes, farm incomes are only secondary compared to off-farm income. If we do not only look at agricultural income by considering sales but also add the value of food consumed at the household, then the total combined value of farm income is about at par with off-farm income for the SSP group. For the reference group farmers, the total combined farming income remains less attractive and only reaches 36% of total income.

**Figure 17: Share of income sources towards grand total income on median level**



These findings illustrate that SSP's work is giving new relevance to rural communities, it improves the food quality and quantity, it enriches diets and contributes to better health, and it makes farming also economically more attractive again. Thus, the SSP interventions clearly make a contribution towards strengthening the farming income base of households. This can also be interpreted as an indication that the diversification of crops and livestock activities has supported incomes and in particular the drought situation was overcome better than the reference group.

These differences in income between the study groups are found statistically significant at all levels: farm income, subsistence income and grand total income. The influence of key agricultural production factors on income levels is shown in appendix 1, Table 44, p.114. More income details are provided in several other tables of the same appendix on pages 113 to 116.

It is noteworthy, that there are big differences in income in particular for the lower and upper income groups. The project strategy to focus on food for the household first, benefits in particular the poorer households. It should be noted that farm income for the low income group are augmented almost fivefold compared against the reference groups. Considering that a key global development goal is poverty reduction, SSP's work has achieved a major impact on this important field. Consequently, SSP's strategy with its focus on food security can be praised as inherently pro poor. Thus, the work of SSP can be also seen as a good example that Misereor's rural development strategy is highly

relevant for the needs of the poor; it helps to raise incomes in particular for the poorest of the poor, aims towards risk reduction and diversification while raising production gently and sustainably, achieving better health and environmental benefits as simultaneous synergetic outcomes.

For interpreting these results it is important to recall the situation of drought for two consecutive years. As many farmers stated the drought decreased their crop yields dramatically during the last two years. Thus, it appears quite likely that in normal years, the income situation achieved through agriculture would be more favourable.

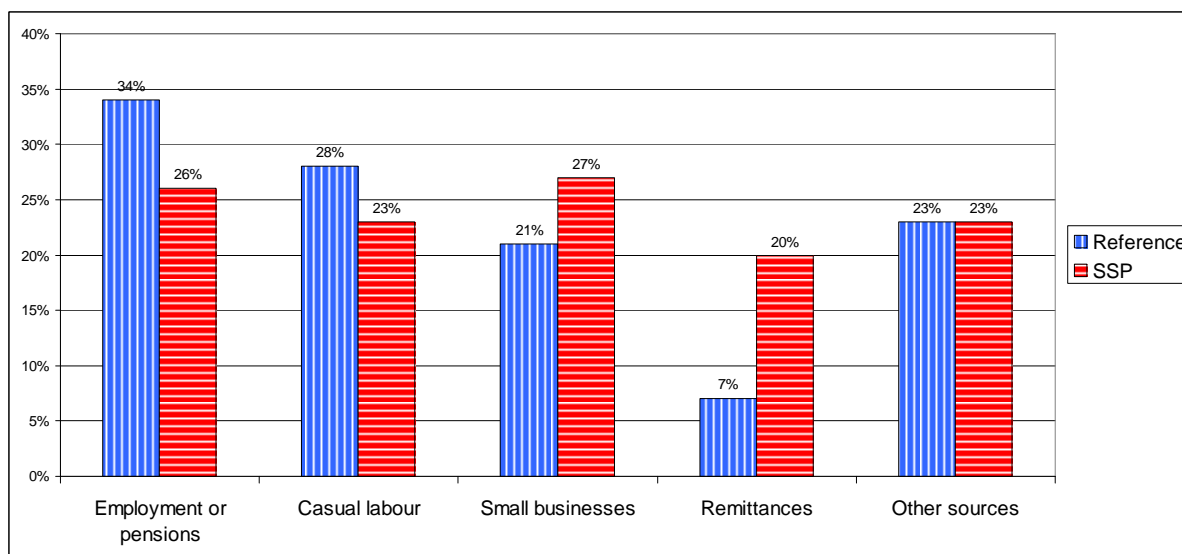
The data also shows that, in particular for the reference group, off-farm is the major source of income. It may be concluded that the farms are too small and the weather patterns are too unreliable, so that farmers cannot depend solely on their farming income only, and thus, families use a diversification strategy of multiple income sources to ensure their livelihood. The following table provides an overview on the various different sources of off-farm income for the upper income segment. The upper income groups derive their income from more different sources. The poorer farmers almost exclusively rely on casual labour for off-farm income only. This makes the poor households very vulnerable to climate change. In drought years, casual labour opportunities decline strongly and thus, poor households suffer double in difficult years, as both agricultural and off-farm income sources shrink. In the higher income segment, fixed employment and pensions are the most important source of external income.

**What sources of income do you have?**

*"I own three acre land that we cultivate. I also have three bore wells and three acres can be irrigated in good years. This year, however, I can only irrigate half an acre. I also have two cows and sell the milk. Another source of income is the flour mill and rice mill. I earn more income from the farming compared with the mills. Both of us, my husband and myself, we work in the mills and on the farm". Ms. Mainbai Jadhav, Medsinga village*

*"We are all doing farming. My husband is retired and also working on the farm. My oldest son is an army officer. For 8 months in a year he is away. Our second son works as a driver and he lives here in our household with us. His wife is also helping with farming and earns some money with part-time tailoring". Ms. Mahanaula Craikwail, Salgara village*

**Figure 18: Sources of off-farm income for P90 and P95 income groups**



Second most important source is small business and this it plays a bigger role for SSP farmers. This may be attributed to the business promotion activities implemented by SSP. Casual labour plays a bigger role for the reference group (28%) as for SSP (23%). Other income sources contribute almost another quarter to the total of off-farm income. More details on off-farm income are provided in Appendix 1, Table 43, p. 113.

After off-farm income, a closer look at the various sources of farming income is given. As could be expected, crop sales play the major role and these contribute 51-52% towards total farm income. In second position come milk sales (SSP 30%; Ref, 21%). Animal sales play a greater role for the reference group (24%) compared to SSP (15%). Poultry revenue was rated zero for all farmers. It could be that large-scale poultry production makes this sector uninteresting for small farmers. Other products only contribute 4% to farm income. It should be noted that these percentage figures only apply to the upper income group (P90). The lower income groups derive their income to 100% from crop sales only. The detailed information is provided in Appendix 1, Table 43 and 49.

So far the analysis showed the picture based of gross income. Now we take a look at net incomes by subtracting production cost and private expenditures from gross revenues<sup>37</sup>. The outcome is shown in the next overview table that depicts the situation for a medium level (P50) household.

**Table 33: Total farm income and cost overview for median farm (Rs.)**

Reference P50		SSP P50	
Value food consumed		Value food consumed	
18,333		30,553	
Off-farm income	Farm income	Off-farm income	Farm income
79,400	26,500	80,000	47,400
Off-farm costs	Farm costs	Off-farm costs	Farm costs
0	29,300	0	32.800
Net off-farm income	Net farm income	Net off-farm income	Net farm income
77,250	-3,800	78,000	11,425
Net income including food value		Net income including food value	
99,975		131,523	
Net household cash income		Net household cash income	
77,578		105,685	
Private house hold expenditure		Private house hold expenditure	
85,300		83,800	
Net h/h balance (savings or loss)		Net h/h balance (savings or loss)	
-19,800		16,800	

The comparison shows that net off-farm incomes are almost identical for both groups. Expenditure, on both food and household items does not show major differences between both study groups. Spending patterns only change with income levels. More details of spending is provided in Appendix 1, Table 69; pp. 158.

Using the spending figures to calculate net-farm income, it can be seen that the balance of farm income for the reference group is slightly negative (Rs. -3,800) while it is

<sup>37</sup> Including costs shows the true income derived from all sources. Probably, due to the drought years almost a third of farmers (Ref. 29%; SSP 18%) had a negative balance, with farming costs exceeding farming incomes. The fact that sustainable farming techniques recommend to use less external inputs also shows benefits here.

positive for the SSP group (Rs. 11,425). This highlights that farming is hardly profitable for both groups. The SSP group is doing better due to higher gross farm income. Due to the higher value of farm-consumed food the net income including subsistence is about 31% higher in the SSP group compared to the reference group. Regarding net cash income the difference between the two groups narrows down somewhat. The private expenditure is close to 85,000 for both groups and thus the net balance falls slightly negative for the reference group and slightly positive with a similar amount for the SSP group.

Considering that the off-farm income in both groups is identical, the critical difference comes from the higher value of food produced on the farm (the SSP farmers need to buy less food) combined with higher farm sales.

☒ Again it can be seen, that also for net incomes, the key element of the SSP strategy to centre on food security, and reduce the costs for buying food, pays out. It is the crucial subsistence income that makes the difference for an average farmer to stay profitable, while reference farmers need to take up loans to cover up their losses.

Keeping a positive cash flow is of crucial importance for all households. Considering the high interest rates on loans in India (15-25%), it can be understood easily, that the rather little difference between the two groups may make a substantial difference after only a few years. A key statement given by many women during the focus group discussions is that "since we work with SSP, we do not need the money lenders any more".

The problem of interest rates and debt become very obvious if we examine the income balance for the poorer income segments. This calculation is shown in Figure 19. For the reference group, the situation is dramatic, all lower income percentiles show a heavy debt (Rs. 80,000 to -170,000) while even on the median, the balance is still negative (Rs. -19,800). For SSP farmers, the situation is considerably better in all categories, however, also P10 to P25 are deeply in debt while the median group at least shows a little positive balance (Rs. +16,800). Once again, the two consecutive years of drought are most probably the major factor for explaining the figures.

***Do you require loans to support your production?***

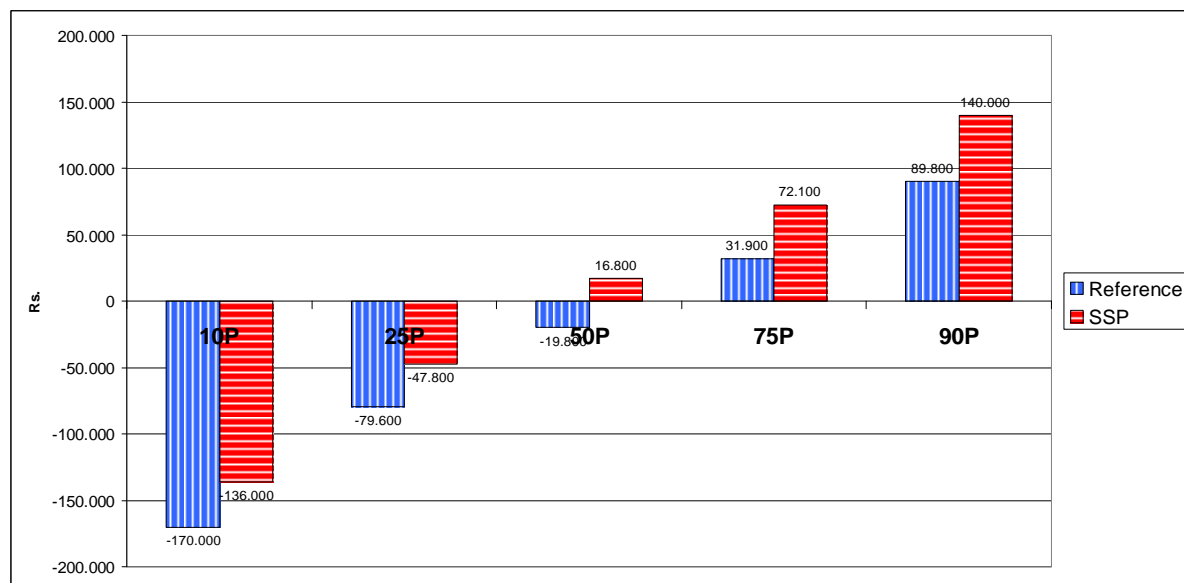
*"We start small scale from the kitchen garden. There is no need for loans. Also, the dependence on the local money lenders have drastically decreased as we women now can access small loans from our own groups".  
Ms. Archana Patil, farmer leader, Devshinga village*

***Is food produced on your farm cheaper?***

*As we use own seeds and own manures, food produced in our farm is far cheaper than what we buy from outside. Also, when we sell produce in the market, owing to increased supply, the price decreases. By the time we go to the market to buy the produce, demand for the produce is more than supply and hence it is costly. FGD, Masala Khurd village*

For the poorer farmers (P10) the amounts of debt are in the range of a full annual income of an average farmer (see Table 32). This means that a poorer farmer may need at least another 2-3 years to recover from the debt accumulated during the last drought. If we consider the rainfall data presented earlier (see Figure 8, p.42), then there are on average at least 2 years in every 10 years with major deficits in rainfall. This shows that in particular the poor households can get into a debt trap very easily. Some SSP farmers have managed to escape from this trap; however, the situation for a large number of farmers still remains serious.

**Figure 19: Annual balance according to percentile groups**



This can be seen from the following table that highlights the long-term financial situation of the households. The income balance showed that some 40-50% of farmers had a positive balance. A similar number of farmers state that they never had any debt problem (Ref 40%; SSP 52%). For close to 10% of farmers in both groups debts are the same and a few more indicate that they could reduce the volume of debts. However, 34% of SSP farmers, and even more reference farmers (45%) stated that their debt problem is getting worse. This finding is certainly alarming. SSP could improve the situation for a group of about 20% of farmers substantially, but the remaining farmers are either affected very little and a good third of farmers remain in a debt trap situation.

**Table 34: Changes in long-term financial situation**

Financial situation	Reference %	SSP %
I never had any debt problems	40.3	52.6
I manage to decrease the volume of debts	13.8	9.5
Debts are the same	7.7	8.4
The debt problems are getting worse	44.9	34.2

For the global debate on poverty, we take a look at total income per person and day including consumption and all sources of income.

The findings demonstrate very clearly that rural Indian incomes in the study zone have been very low also using a global reference scale. Based on the median, reference farmers earned only US\$ 1.31 while SSP farmers were comparatively up by 26% at US\$ 1.65.

This means that average farmers all fall considerably below the world poverty line that stands at (US \$ 1.90; World Bank 2015). Only the upper quarter of farmers P75 and above exceed the poverty line. A good result is that SSP managed to raise in particular the incomes of the poorer farmers (P10 +40%).

**Table 35: Grand total income per day per capita in Rs. and US\$<sup>38</sup> in percentiles**

	Currency	10P	25P	50P	75P	90P
Reference	Rs.	33.71	55.50	<b>84.05</b>	123.58	233.85
SSP	Rs.	47.31	68.08	<b>105.52</b>	171.22	299.76
Reference	US\$	0.53	0.87	<b>1.31** a)</b>	1.93	3.65
SSP	US\$	0.74	1.06	<b>1.65** a)</b>	2.67	4.68
+SSP/Ref.		40%	23%	<b>26%</b>	39%	28%

UAV test: Sig 0.003 highly significant

Once again, it should be noted that this figure is strongly influenced by the drought situation. For normal years, the income situation would be certainly better. Nevertheless, in semi-arid areas droughts are a natural recurrent phenomenon, and therefore, such low incomes are likely to occur once or twice in 10 year intervals.

The validity of these findings can also be assessed by taking a look at other Indian income related studies. The Planning Department of the Government of Maharashtra (2013) calculated the annual rural per capita income for the region of Marathwada in which Osmanabad falls as 40,824 Rs. for 2009/10. In the context of the preparation of a rural energy project SSP conducted another income study with more than 900 households in the neighbouring District of Latur (SSP unpublished 2016). The average annual income here is 42,815 Rs. Using the reference group daily income of 84.05 Rs. gives an annual per capita income of 30.678 or employing SSP farmer's daily income (105.52) this would result in 38,515 Rs.

Finally, we take a look at the income situation of the household over time. Here, we try to answer the question has the SSP intervention helped to improve peoples' income if we compare the situation before the project (before 2010) with today. The trend is depicted in the next chart.

**Figure 20: Income trend 2010 to 2015**

The findings confirm our above income data very well. A little more than a quarter of SSP farmers say that their farm income is better or even much better (27%) and almost half (48%) state that their off-farm income improved. In the reference group the ratings are much lower (farm 9% and off-farm 30%). About a quarter of all farmers in both groups see no changes of income. If we now look at the group of households that state a decreased income, the alarming picture of our above annual balance is reconfirmed. In the reference group 30% stated that off-farm incomes are reduced and even 65% complaint that farm incomes are lower. For SSP farmers the situation is a little better, only 24% speak of reduced off-farm income and 48% faced reduce farm incomes. It is important to note that for both groups farm and off farm income complemented each other. Thus, the good off-farm income could balance out to some degree the

**Has your income changed if you compare it with before the project?**

"We as women have increased the land that we are allowed to manage and control. This helps us to produce more. We can sell vegetables and pulses in the market. All together we increased our income by about 40% if compared to the time before the project". *FGD, Masala Khurd village*

<sup>38</sup> Average annual exchange rate for 2016 of INR to US\$ of 1 US\$ = 64.02 (OANDA, 2016)



negative farm income trend in the last years. However, not for everybody, in the reference group 30% and for SSP 24% of households also faced a decrease in off-farm income. The reason is most likely, that many households in the rural areas depend on casual labour work on bigger farms. During strong droughts, also the bigger farms can't offer any jobs and then, these vulnerable households are hit double hard.

The mid-term evaluation (StartUp 2014) conducted before the drought drew up a much brighter picture on the income situation of SSP households. The current findings mirror the effects of the drought very evidently. SSP managed to improve the situation for a good number of people, but the difficult environmental framework for farming in the last 2 years wiped out many of the benefits. This highlights the fact that project interventions only have a limited scope of influence. The better resourced farmers, in particular with access to irrigation water, managed it easier to cope with the drought.

- ☒ This shows that creating better income requires a comprehensive long term strategy. SSP's strategy to support both off-farm income through entrepreneurship and leadership training just as well as farm income and nutrition focused activities worked. All sources of income play a vital role in improving the living conditions of the rural population. Only if the households adopt better practices over a long time, gradually improving their farms with continued investment in better farming activities and in particular by upgrading the biodiversity with crops and trees and more intensive animal husbandry, they will be able to raise farm incomes and farm productivity.
- ☒ With regard to total household income and better livelihood it is important to make best use of good alternative job opportunities as well, this is of particular importance in the context of semiarid regions, where climatic shocks such as severe droughts may hit once or twice in any 10 year period. Thus, spreading risk through multiple income sources is an important adaptation strategy for farmers. Obtaining a good education<sup>39</sup> for the families' children is an important help in finding good outside jobs, something that is better than just casual labour for other farmers.

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<sup>39</sup> SSP farmers invest slightly more into education than the reference group. However, investments are limited to the more wealthy farmers (see Appendix 1, Table 70 p.160).

## 4.6 Improved livelihood and prospects for sustainable agriculture

In the last chapter we could see that sustainable farming can give a noteworthy contribution to enhancing peoples' income. However, the data also showed that farming is subjected to considerable climatic risks that affect income. Nevertheless, sustainable farming helped to reduce these risks at least to some extent. This is certainly a good finding.

But what is the role that this income plays for people? Do they consider the income as sufficient? What are alternative sources of income? Are other sources of income more attractive? Do people migrate less due to higher income from farming?

The focus group discussions with farmers give some answers on these questions.

Regarding different sources of income, literature data shows that India is characterized by strong income disparities between urban and rural areas. Ravindra H. Dholakia et al. (2014) highlights these differences for a number of Indian states, in Maharashtra, urban incomes are 3.1 times higher than rural incomes, for Andhra Pradesh the rate is 2.2 and for Bihar, one of the poorest States in India, the relation is 2.8. This information would suggest that work in farming becomes more and more unattractive and this is certainly also one of the reasons, why many people leave the rural areas and move to the cities. Is this also the case in the study region?

The focus group discussions and the individual talks with some families showed that people are aware of these differences in income opportunities. They also try to benefit from this situation by sending a family member or two to urban centres to find a job in cities. But they also see the difficult sides of this migration.

Ms Nana Garud is a remarkable lady. With shining eyes and full of joy she tells the story of her life:

*"I have been working as a migrant worker in various areas in India. Without any own land, my life used to be very difficult. I was always at the mercy of other people. I had to walk long distances to find any work. One of my sons is working in Pune; another son is working abroad in Dubai. They have sent me money and with that money I could buy me one acre of land. With the training of SSP I learned how to grow everything organically. My life is so much better now. I even have become a farmer leader, teaching other women how to do all thi."*

Nana Garud's story is inspiring for many women. Her livelihood is changed so profoundly. The money sent by her sons to get her started in farming played an important role, but it is not the only thing. She can now teach other people. She is so happy about this. Her status within the community is completely changed; she is now respected for her knowledge and abilities. This shows that social values play a big role to people. Being respected and part of the local community may count even more than the money.

Ms. Vanitha Balbhim Memshti of Chiwari villages shares her point of view:

*"Some 20 people migrated from my village. Mostly the highly educated migrate. Because of their good education they can find a better job in the city. In the city money is good but housing is very costly and very small. In the village money is short because you can't earn much but many things are for free. In town you pay for everything, even for water".*

The women in Tirth Khurd Village call their farmer group "Nirsag" - that means nature and they see migration happening like this:

*In the last four years it is mainly youth migrating from the villages to the nearby cities: Pune, Kolhapur, Solapur and Mumbai. Mostly they get employed in private companies, as drivers, carpenters, retail, service sectors, etc. Most of the households in this village have at least 1 person migrated to another city in search of employment. Overall 10% of the total population may have migrated from their village.*






Rural people are very clear that it is not only money that counts alone. They love their rural life very much. Ms Surekha Jadhav from Medsinga village states very proudly:

*"Rural life is much better than urban life. 1. more healthy 2. less pollution 3. In towns, we need to purchase everything including water. In rural areas, there are more alternative options. We have good relationship with our neighbours who come for your support. We get many things for free. Everything we get is fresh. The attachment of people to our village is very high. We like to live here and we would not want to go away! We enjoy our life here."*

Often people in the cities look down on farmers. Being a farmer doesn't have a high social status. We ask Ms Surekha Jadhav from Medsinga village: Are you proud to be a farmer?

*"Yes. Yes! The best for us. Only now it is different due to the drought. This depends a lot on nature and nothing is in our hands. Luck is important. We do farming with planning. That is very important we need to think properly about the market chances and everything. Yes we are very proud. We have no other option but to be very proud."*

We ask people what are the values that count. In Devshinga village we ask the focus group of women how they define happiness:

-  Better Health for the family
-  Better incomes
-  Good education for children
-  especially for girl child
-  Quality experience gained from several activities and events
-  To be able to share knowledge and practices to many other farmers
-  Receive appreciation and acknowledgement for the work and practices they are doing
-  Increased mobility - freedom to move
-  Financial independence
-  To be more confident
-  There is a support system from the groups in times of need
-  Recognition from family members and villagers
-  Recognition by the Village heads and key resource persons and increased status in the village
-  Prosperous farms with machinery and tools

Womens' own words for defining happiness demonstrate very clearly what matters in their life. They mention income, but they mention many more things such as self-confidence, recognition and the future of their children just to name a few of the points. The statements show very clearly that the people are happy to live their rural life. The work of SSP has helped them to gain confidence and to see many more opportunities

also in farming. Sustainable farming practices can help them to produce more and create extra synergies by giving better health and nutrition.

The many comments of women show that money is just one side of the coin, reinvesting money wisely in farming and also into the education of children is very important too. SSP's work can be seen as instrumental in revitalizing the local culture and demonstrating how a positive development for the overall livelihood of people can be achieved.

With this good example in mind, we can try to look beyond the borders of the study region. What would be the effects if this type of sustainable agriculture was to become the norm, i.e. if it was to be applied on a wide scale? Would this type of development represent a good blue print for India? Could the model secure the food security of the urban centres?

The data of this study showed very clearly that the productivity gain of the sustainable agriculture model (calculated as the cumulative farm production of the top 14 crops cultivated) is in the range of 20% under conditions of drought. Therefore, it can be reasoned conservatively that in normal rainfall years, the productivity difference could be similar or even better. Consequently, sustainable agriculture would be a realistic option to replace the current conventional farming practice in India. Applied on a wider scale, sustainable farming would be an appropriate means to improve production and reduce nutritional problems. Due to the reduced cost of production, food could be made available in the remotest areas to the poorest households. Therefore, it would assist in particular the poorest households better and thus could complement other poverty reduction strategies such as the PDS system. Another key advantage of sustainable farming is that it targets higher levels of food security of farmers. In this way the strategy does not depend as much on marketing and associated price risks. Conventional farming often leads to larger production surpluses, that, as experience in India has shown many times, may end-up rotting in storage houses as the poor do not have sufficient purchasing power to buy these foods. Consequently, the 20% production gain suggested by the data of this study would ideally close the current malnutrition gap that is faced by about one fifth of India's population. Under normal rainfall conditions, even more so in good years, even semi-arid areas could produce a certain surplus that could help to feed the growing food demand of the urban areas.

The problem is not that sustainable farming per se is not appropriate, the problem is rather that the knowledge about its potential benefits are not sufficiently known by political leaders in India, and even worldwide; skeptical views on sustainable agriculture are still widespread. Consequently too little funds are available for sustainable farming, rural development and rural transformation in general. It is the hope of the study team that this study may contribute to reduce this skepticism.

The women farmers in Osmanabad have clearly understood what is best for them. Asked about their future plans they say:

*"We want to adopt organic practice on even more land and gradually reach out to the whole land eventually. We want to improve on local seed production more, and expand on the diversification of crops. We want to promote health and nutrition awareness among the women in our area". FGD, Devshinga village.*

## 5 Resilience

In recent years the concept of resilience is gaining more prominence in the debate on how to achieve more sustainable development (Stockholm Resilience Centre n.D.). In this context the research team decided to review the field data of the reference group farmers as an example for conventional farming and the SSP group as an example for sustainable farming and compare both systems through a "resilience lens".

A typical definition of resilience is given by Bennet et al 2014: "*Resilience is a system property related with the ability of a given system to recuperate from external impacts without compromising its functional and structural properties*".

In this definition of resilience, the central element is the coping capacity to external impacts. Collaborators of the Stockholm Resilience Centre go a little further by formulating a broader resilience approach: "*A resilience approach to sustainability focuses on how to build capacity to deal with unexpected change. The approach moves beyond viewing people as external drivers of ecosystem dynamics and rather looks at how we are part of and interact with the biosphere - the sphere of air, water and land that surrounds the planet and in which all life is found. A resilience thinking approach tries to investigate how these interacting systems of people and nature - or socio-ecological systems - can best be managed to ensure a sustainable and resilient supply of essential ecosystem services on which humanity depends*".(Stockholm Resilience Centre n.D.)

The broader definition explicitly highlights the importance of building coping strategies to stresses by taking the whole socio ecological system into view. With this broad system view in mind the editors of the Centre suggest a set of seven principles that can be used to an analytical framework of resilience. These principles are defined in the following table.

**Table 36: Principles for building and strengthening resilience**

Principles	Description
1. Maintain <b>diversity</b> and <b>redundancy</b>	Systems with many different components (e.g. species, actors) are generally more resilient than systems with fewer components. Redundancy provides 'insurance' within a system by allowing some components to compensate for the loss or failure of others.
2. Manage <b>connectivity</b>	High levels of connectivity can facilitate the recovery of landscapes and other ecosystems after a disturbance (like a storm or a drought) but highly connected systems can also spread disturbances faster.
3. Manage <b>slow variables</b> and <b>feedbacks</b>	Slow variables include soil and land use patterns or forest cover, both of which influence the access to food, fodder, firewood and other collection resources. Access or depletion of such resources can strengthen or reduce the capacity of an individual or community to deal with other shocks.
4. Foster complex adaptive <b>systems thinking</b>	Research has shown that a management approach that is based on 'complex adaptive systems thinking' can create and enhance the resilience of social-ecological systems.
5. Encourage <b>learning</b> and <b>experimentation</b>	Knowledge of any system is always partial and thus efforts to enhance the resilience of social-ecological systems must be supported by continuous learning and experimentation to enhance overall system performance.

<p style="text-align: center;"><b>6. Broaden participation</b></p>	<p>Active engagement of all relevant stakeholders is considered fundamental to building social-ecological resilience. It can build trust and help to create shared understanding and uncover new perspectives that may not be acquired through more conventional scientific processes.</p>
<p style="text-align: center;"><b>7. Promote polycentric governance systems</b></p>	<p>Well-connected governance structures can swiftly deal with change and disturbance because they are addressed by the right people at the right time.</p>

Source: Stockholm Resilience Centre n.D.<sup>40</sup>

For the purpose of this study, the above principles are used as an additional analytical framework to compare the two farming systems under study. We will take a view at each resilience principle one by one.

***Principle 1 - Maintain diversity and redundancy***

In a farming systems context, the number of crops grown by farmers and the number of wild species available on farm are the good indicators for overall biodiversity. Animal species and breeds kept of farm could be rated as additional indicators for diversity. Looking at crop diversity first, it was shown earlier that SSP has also encouraged farmers to grow more different field crops. While the reference group farmers cultivate only 5 crops (median), SSP farmers cultivate on average one crop more (6). This is a first indication for more resilience in the SSP group. An important additional point of increased diversity is that SSP farmers have taken up growing more minor crops. As rather few farmers grow these minor crops so far, the results do not come out very clearly with the overall average. However, in comparing the total number of farmers growing minor crops, the differences are striking. The number of onion producers has almost doubled, the number of linseed and maize producers has risen 3.5 fold and the number of sesame growers even rose more than fivefold (see appendix 1, Table 54, p.119).

The above figures point towards higher biodiversity in terms of crops or simply towards more diversity if more families produce new crops now in the same village or region.

In addition to field crops, farmers keep tree crops and other wild flora on their land. In this respect, it needs to be noted that the state of the natural vegetation in the study region could be rated as already heavily degraded. Due to the introduction of tractors and ploughs already many years ago, much of the original tree cover is gone. During the field visits in the project villages, no larger remaining natural forests could be observed. The little of natural vegetation visible is limited to the small farm bunds that separate farmers' fields or tiny spots of barren land that are unsuitable for arable cultivation. Out of the 400 farmers interviewed, only a single reference group farmer declared that he has an acre of land covered with tree crops only.

Nevertheless, the little land available didn't stop farmers to preserve species of interest. The tree number per acre are little but show a clear advantage for the SSP group as demonstrated in the following two tables.

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<sup>40</sup> The brochure of the Stockholm Resilience Centre draws its concept on a book published at Cambridge University press by R. Biggs, M. Schlüter, M. Schoon (ed.) 2015: Principles for Building Resilience. Sustaining Ecosystem Services in Social-Ecological Systems.

While the number computed per acre is low with just 1-2 trees, the total number of other trees preserved on all the land<sup>41</sup> shows a quite remarkable six-fold advantage for the SSP group.

**Table 37: Total number of tree preserved on farmers' fields**

Parameter	Reference	SSP
Total number of fruit trees grown	373	597
Total number of all other trees	478	2973

This very high difference may have to do with the heightened awareness for biodiversity. While reference group farmers had big difficulty in estimating tree numbers, SSP farmers found this task easier due to the raised awareness and associated protection of vegetation in their fields. In landscape with degraded vegetation due to population pressure and agricultural activities that characterizes the study region, even small patches of trees are important to promote environmental improvements. These trees and natural areas of pasture have a functional role as refugee for birds and beneficial insects that may help to control pests. In addition, recent studies show that forests and trees play a fundamental role in promoting sustainable diets (Vinceti et al., 2013).

Additionally, more trees and natural grazing areas in the landscape are also associated with biomass production and soil organic matter, which in turn represents carbon sequestration and mitigation of greenhouse effects. As mentioned above, these features are extremely relevant in semiarid regions.

While the overall average number of fruit trees is still rather low, there are good signs for a considerable revival of fruit tree growing in the SSP group. The number of farmers that have guava, tamarind or lemon trees doubled compared to the reference group. Very noteworthy is in particular the Moringa tree. Here the number of growers is doubled but also the number of trees per farmer increased fivefold.

**Table 38: Main tree species found in the farms and number of growers**

Tree species	Reference		SSP	
	Cases of growers	Mean no. trees	Cases of growers	Mean no. trees
Other tree species	180	3.2	186	4.4
Mango	90	2.5	108	3.3
Ziziphus ber	52	2.4	80	5.4
Lemon	27	2.1	63	1.4
Moringa (drum stick)	27	3.9	62	20.7
Tamarind	35	1.6	52	1.8
Custard Apple	21	2.6	35	2.7
Coconut	19	4.6	35	1.7
Guava	13	1.5	28	1.5
Indian gooseberry	13	2.3	25	2.9
Jamun (Szygium cumini)	12	1.3	23	1.4
Castor	5	7.4	15	11.9

<sup>41</sup> The total area is about 800 acres (400 farmers \* 2 acres).

This finding is a very good indication for resilience. Moringa leaves can be eaten all year as fresh vegetables and do not require extra irrigation water. Thus, this tree enhances biodiversity, leads to additional carbon sequestration and improves the availability of fresh food to families, and consequently enriches the farming system in many ways.

The resilience concepts looks at biodiversity and redundancy as two key aspects linked under principle 1. In a systems context, redundancy refers to the functional and/or structural equivalence (substitute) of a given variable.

An illustrative example is the role played by certain food crops as sources of energy (carbohydrates). Sorghum, millet, wheat, rice or cassava have somehow similar function, and the combination of cultivation of these species all contribute to a good energy supply. The food production statistics provided in chapter 4.5 showed that SSP farmers have a 20% higher production for the selection of the top 14 crops. Thus, redundancy is high, if any crop fails, there are many more in the farming system that can help to take the place to ensure food security and reduce the overall risk. In susceptible areas as the one investigated, this trait tends to be even more critical as the likelihood of crop failure due to frequent droughts is very high.

**Principle 2 - Manage connectivity**

The second principle for resilience focuses on connectivity, that is, the degree of environmental and social interaction and connection. High levels of connectivity can help systems to recover from severe impacts such as droughts, storms, floods, or economic crises.

The study data confirms that SSP farmers show higher levels of connectedness compared to the reference group. SSP farmers participate in a wide range of organizations such as self-help groups, farmers groups, and seed growers’ collective schemes. The number of organisations in which they are members is substantially higher when compared with the reference group, as showed in the next table.

Practically all SSP families (97.5%) participate in one or more social groups such as SHGs or farmer groups. In contrast 58.5% of the reference group do not participate in any groups or organisations. This highlights a marked difference in connectivity as demonstrated in the next table.

**Table 39: Membership of organisations**

Organisations	Reference %	SSP %
None	58.5	2
SHG	30.5	97.5
Farmer group	18	74.5
Gran Panchayat	0.5	0
Village development committee	0.5	0
Other specify	1.5	1.5

The history of SSP is a good example of connectivity. SSP started its work in the 1990 after a severe earthquake to assist with organising people and coordinate disaster relieve measures. Many of SSP's SHG date back to these disaster relief times and have taken up additional new tasks in the course of time.



The self-help groups are good examples of long lasting connections among people in which all members are committed to help each other. Such connection among its members has a positive effect on each family, as they will always be able to rely upon their fellow members. In fact during the group interviews (PRA) farmers assisted by SSP reported that they were better prepared to cope with problems such as the drought period because they were more organized, when compared with the reference group.

### ***Principle 3 - Manage slow variables and feedbacks***

Several environmental variables such as soil fertility or forest cover are considered as "slow" variables because it generally takes long periods of time for a forest to grow up from a plantation to maturity or for soil humus levels to be restored. The fact that these environmental resources change so slowly also means that there is limited feedback to the users about the often destructive consequences of their resource utilisation. Resource users may not realise their wrong practice, until training and awareness measures create the necessary feedback on how slow variable function and how they need to be maintained and managed in a sustainable way.

The maintenance and replenishment of soil fertility has been a core activity of SSP's work and consequently scores high for this resilience principle. The reference group farmers have not been trained in this respect. Consequently, they are less aware that other slow variables, such as for example chemical nitrogen fertilizers (e.g. urea), increase the mineralisation of organic matter in the soil, and as such, slowly contribute towards a depletion of soil organic matter over longer periods of time.

The work of SSP on trees that was mentioned earlier in relation with the principle 'biodiversity' can be counted here again as another slow variable that promotes resilience.

### ***Principle 4 - Foster complex adaptive systems thinking and Principle 5 - encourage learning and experimentation***

The one-acre model by itself is an illustrative example of fostering complex thinking. Farmers are encouraged to add a wide range of crops and practices to their current system, and thereby, they increase the complexity and resilience of their farming system.

Based on this model, women farmers are encouraged to experiment and conceptualize production systems beyond what they are used to do. Agroecology, biodiversity, drought-coping strategies in semi-arid environments and food security are all topics that deal with complex adaptive models, and aim to spread risk in order to hedge against uncertainty. Also illustrative examples are the ways in which SSP families have developed their own strategies for living in a drought-prone environment. Equally, as shown in Table 20, p. 66, a number of improved practices such as seed inoculation, utilisation of own seeds, cultivation of vegetables, intercropping, cultivation of fodder through hydroponics and azolla as supplementary fodder are encouraged. Such practices involve complex thinking and require a sophisticated understanding of the multifaceted interactions and dynamics that exist between humans and the environment in a social-ecological system.

Contrary to the solutions proposed by conventional agriculture, where most technologies are designed to follow a simple direct cause and effect relationship (e.g. lack of soil fertility -> apply fertilizer; insect attacks - use insecticide xy, etc.), organic farming solutions tend to be systemic, meaning social and environmental attributes are

intimately intertwined. To stay with the example of low soil fertility, organic solutions involve for example animal manure, legume intercrops, fertilizer trees just to name a few of the more complex possible solutions.

SSP households have undergone extensive training programmes and capacity building activities, linking directly with Principle 4 'systems thinking' and Principle 5 'encourage learning'. It is actually a question if principle 5 'encourage learning' is a separate principle by itself. All principles mentioned so far require active learning and therefore it is not very specific for resilience, but could be applied in almost any context.

So far the SSP training programs have created a good start-up, but the number of good adopters is still limited. This shows that some of the learning messages still require further adaptation and this can also be achieved by the element of 'experimentation' mentioned in this resilience context. Farmers need to learn to experiment actively, to find out what solutions work best on each farm. This is certainly an aspect that is as yet not fully developed.

### ***Principle 6 - broaden participation***

Broad, democratic participation in decision-making is another significant characteristic for promoting resilience. Among farmers advised by SSP such participation occurs on different levels, from the farm, where women have voice on decisions, to the organisations and self-help groups to which these families belong.

Many SSP families report that women now participate in decisions about the overall management of the land, including what and how to cultivate. They explain that this process encourages a deep engagement of all family members and a commitment to constant improvement of the farm. Some studies show that production is substantially improved on farms where family members more actively participate in decisions (Ms. Mainbai Jadhav, Medsinga village and Ms. Vanitha Balbhim Memshti, Chiwari village). This is a very clear social innovation promoting more participation for women among the SSP families, opposed to the reference group where decisions are taken by the male household head only.

Participatory structures, such as the many organisations to which the interviewed families belong to, are another means of broadening participation. Such structures are formed by families with common views and interests – in this case organic production – and have a very horizontal format, in which all members have a voice in the decision-making process. Due to its various sectors of intervention (health, entrepreneurship, farming) SSP has provided better access to different organisations in the intervention zone.

### ***Principle 7 - Promote polycentric governance systems***

One element of SSP's work is the amplification of synergy between existing government services. Thus SSP plays a complementary role by not duplicating existing services, but improving service delivery to rural families. In addition, the existence of strong groups make it easier for any other service providers to reach out to the rural population. In this sense the programme has exactly achieved what is called here 'promoting polycentric governance' structures. The discussions with reference group families showed that these are often unaware about what government services exist. They are rather intimidated by government structures and consequently they rarely access any services offered.

Thus, SSP has made a very strong progress in relation to this principle, promoting more resilience of the households by linking them closely to self-help groups and government systems.

### ***Conclusions on resilience***

The comparison of both farming systems shows a number of clear advantages for the SSP system. For all the seven principles for resilience reviewed here, the SSP group clearly performed better than the reference group.

SSP has achieved very strong effects towards promoting more resilience through the principles targeting 'participation', 'connectivity' and 'polycentric governance' (2, 6 and 7). Very clear effects can also be identified regarding the principles 'systems thinking' and 'learning' (4 and 5). Regarding the principles 'diversity' and 'slow variables' (1 and 3), the differences to the reference group are visible, but a broader impact will still require additional extension efforts.


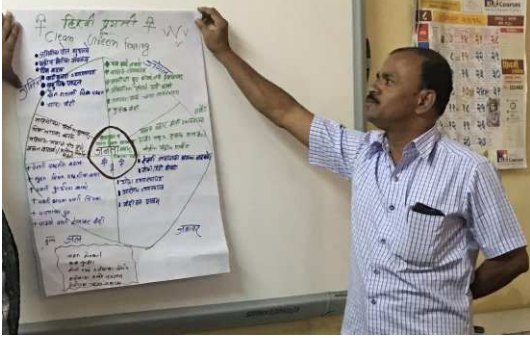
In conclusion, it is possible to affirm that SSP is creating a difference in the Osmanabad region by promoting practices that make farming more resilient.

Some suggestions and recommendations for further improvement of the work are discussed in the last chapter.

## 6 Discussion of findings, recommendations and next steps

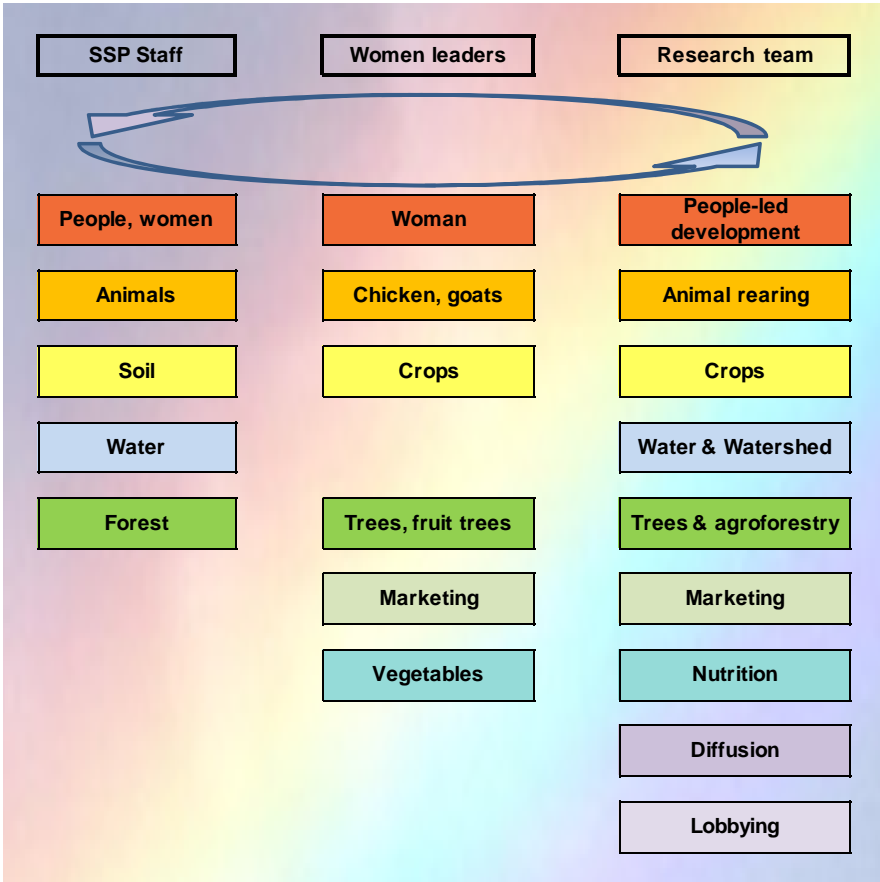
The main findings of this report were discussed with SSP project staff and farmer leaders during a 2-day workshop in Osmanabad in August 2016. The women farmer leader conclusions are presented alongside suggestions of SSP project staff in the next table.

**Table 40: Suggested recommendations by farmer leaders and SSP staff**

Women farmer leaders	SSP staff
	
<p><b>Moving towards development</b></p> <ul style="list-style-type: none"> <li>○ Increase area under intercropping and mixed cropping</li> <li>○ Increase farm based businesses</li> <li>○ Improve land under organic farming</li> <li>○ Providing better market for organic produce</li> <li>○ Increase the number of animals</li> <li>○ Better water management by growing more number of plants with little water</li> <li>○ Increase in number of grains and vegetables grown and consumed locally</li> <li>○ Collective purchase of farm inputs</li> <li>○ Collective marketing of agricultural produce</li> </ul> <p><b>Promotion of farm based businesses</b></p> <ul style="list-style-type: none"> <li>○ Fodder</li> <li>○ Information and mass awakening services</li> <li>○ Food processing</li> <li>○ Plant nurseries</li> <li>○ Kitchen gardening</li> <li>○ Selling vegetables in the village</li> <li>○ Selling Organic manures and pest control solutions</li> <li>○ Dairy farming</li> <li>○ Sale of agricultural inputs</li> </ul>	<p><b>People</b></p> <ul style="list-style-type: none"> <li>● People are located at the center of the polygon. People should get toxin free food as and when required.</li> </ul> <p><b>Women</b></p> <ul style="list-style-type: none"> <li>● Decision making of women farmers</li> <li>● Cultivation of crops</li> <li>● Technical aspects of cultivation of crops</li> <li>● Improvement of savings</li> </ul> <p><b>Water</b></p> <ul style="list-style-type: none"> <li>● Modification in sowing method</li> <li>● Usage of micro irrigation systems</li> <li>● Recharge of wells</li> </ul> <p><b>Soil</b></p> <ul style="list-style-type: none"> <li>● Improve the soil fertility</li> <li>● Organic farming</li> <li>● Change in crops</li> <li>● Management of agricultural waste</li> <li>● Multiple cropping method</li> <li>● Two storied crop method</li> <li>● No grazing on agricultural land</li> </ul> <p><b>Animals</b></p> <ul style="list-style-type: none"> <li>● Encouragement to grow local breeds</li> <li>● Small ruminants to be encouraged</li> <li>● Shed management</li> <li>● Health management</li> <li>● Shed based cultivation of small ruminants</li> </ul> <p><b>Forest</b></p> <ul style="list-style-type: none"> <li>● Plantation of fruit trees</li> <li>● Strengthening and management of bunds</li> <li>● Trees that provide fodder to plants to be planted</li> <li>● Prohibition of open grazing</li> </ul>

The research team has integrated the above suggestions of women leaders and SSP staff into a comprehensive set of recommendations.

**Figure 21: Integrating recommendations**



The recommendations are discussed topic by topic in the next paragraphs.

**Recommendations: People-led development**

- ⊗ Women are the focal point of SSP's work. This approach has shown good benefits and it should be continued. It is a very good strategy to let women take a leadership role on the subjects of nutrition, health, entrepreneurship and agriculture. Women's superior knowledge in these fields can be tapped and brought to the benefit of the family and community. This not only empowers women, but in strengthens the whole family by enlightening men and women, old and young.
- ⊗ Mobilizing people into groups is a key precondition for successful development work. SSP's entry point of creating SHG groups and farmer's groups is certainly a very good starting point. This approach should be maintained and if possible even expanded further in the future.
- ⊗ The women leaders suggested strengthening the savings activities of SHG. This is an important aspect as it can help to generate capital that can be invested later by

the families into needed areas such as agriculture, education or alternative livelihood sources.

- ⊗ It remains to be explored how even the poorest in the villages (landless, very little land holders, jobless, etc.) can be integrated better. SSP should consider creating additional SHGs for these very vulnerable people. May be these people can also just be integrated to a greater extent into existing SHGs. It is a key problem in India and many parts of the world that the poorest people do not have a voice, they are too shy, and often their problems and needs are not taken into account. But it needs to be understood as well that the interests of a family with 4-5 acres of land are very different from the interests of a landless family. Thus, it may not be able to merge people in joint groups. May be creating additional SHG could be a solution. More dialogue between different groups in a village can help to identify untapped resources that can show viable pathways to increase synergies and open up new opportunities.
- ⊗ The income analysis showed that households depend on agriculture and other livelihood sources alike, and therefore, solutions in both fields are needed. The current study examined in particular agricultural opportunities, but in particular for the poor and farmers with little or no land, jobs and services are needed, as they are predominantly bound to earn their livelihood by selling their labour.
- ⊗ A focus of the support work of SSP should be on making the SHG and farmer groups stronger so that they can handle bigger tasks. Women asked to take-up marketing or input acquisition. In this way groups can make progress and develop towards more professional organisations.
- ⊗ For proper group empowerment, it is essential that the groups formulate their own goals and targets<sup>42</sup>. Group leaders and members need to be trained to follow this process and monitor their own indicators for success (self-monitoring and evaluation). To achieve this, it is important to give more responsibilities to group members and to gradually increase the tasks and resources managed by the group. Such self- or internal monitoring can be done in respect of production targets as individuals or in the group (e.g. group target: produce and sell x kg of black gram each months; individual target: Acquire 1 goats by the end of this year). See more of such a participatory monitoring (PIM) approach under the section on diffusion.

### ***Recommendations: Animal rearing***

- ⊗ The women in the workshop showed high interest in chicken and goats. These small animals can be a good starting point. Animals are vital for sustainable agriculture. Animal promotion should be expanded.
- ⊗ Regarding chicken the focus should be offering something special. Encouraging diversity, promotion of special robust local breeds should be encouraged. SSP is doing this already by promoting a black local chicken race with dark healthy eggs. These efforts could be reinforced.



<sup>42</sup> Very worth reading in learning how to design farmer-led processes is the Misereor booklet "Strengthening people-led development" issued in 2010. In particular, the articles of Prasanth and Sangma offer interesting ideas for the Indian context.

- ⊗ Goats should be given a stronger focus as these are more affordable for poor households. Zero-grazing systems should be tested. In this way animals are kept near the homestead and cannot do any damage to field crops. Distribution programmes of free or subsidised goat chicks with the obligation to share the next off-spring with group members showed good successes in many parts of the world. This approach could be tried also here. Preference in animal distributions or other ways of subsidised access for poor families could be a measure to be considered by SSP in future programmes.
- ⊗ If families manage to keep 3-5 goats, then they can also move on to dairy cattle. In this way starting with goats can become a good entry path to rearing more animals and gradually built up wealth.
- ⊗ Dairy farming is also a very suitable farm activity and should be continued.
- ⊗ Better fodder production and integration of fodder planting on farm land and farm bunds should be envisaged. Local sorghum varieties play an important role in existing fodder production. Building on these, also the seeding of new improved fodder varieties that are drought resistant and more productive should be taken up. The international research centre CIAT has produced an interesting new fodder grass "Brachiaria mulato 2" that could be tried. It grows well even with little rain and low fertile soils. Using improved fodder crops can enhance fodder production, raise dairy yields and also free some space for other crops. More information on this crop can be found here<sup>43</sup>.
- ⊗ Hydroponic fodder production should only be encouraged during years of extreme drought for short periods. In normal years this practice is not economic as it uses rather huge amounts of relatively expensive seed.
- ⊗ Efforts should be undertaken to improve animal sheds so that urine can be recovered. This is very important in particular for cow sheds. Urine would be another very valuable source of liquid fertilizer and input for organic sprays.



### **Recommendations: Crops**

- ⊗ The terminology of the one acre model is confusing. Often farms are bigger or smaller than 1 acre and it is difficult for farmers to clearly determine what the 1 acre is and what the rest of the farm is. During the validation workshop a new name was proposed "women-led food security agriculture" and this would describe much better what the project is actually doing. The aim, however, stays the same. Women start small-scale on a smaller plot of the farm. Once the men can also be convinced about the concept, then the family gradually moves to apply sustainable agriculture practices on the whole farm. The aim is to integrate all family members into joint planning and consequently allow for improving the welfare of the whole family.
- ⊗ It is very important to focus on diversification of cropping activities. The more crop species can be grown, the better for productivity and risk reduction. In

<sup>43</sup> [http://ciat-library.ciat.cgiar.org/articulos\\_ciat/mulato\\_ii\\_ingles.pdf](http://ciat-library.ciat.cgiar.org/articulos_ciat/mulato_ii_ingles.pdf)

It is also possible to investigate together with KVK what are the improved fodder grasses or legumes available and suitable for the Osmanabad area.

particular the farmers that still cultivate less than 3 crops need to be encouraged for planting more diversity.

- ⊗ Besides seed sharing in the village, exchanging seed with more distant farmers that cultivate different varieties would be useful. As SSP is working also in other states of India, it should be encouraged to share seeds with farmer groups elsewhere. In this way it would be possible to generate more variety diversity. The best would be to **revitalise seed sharing as a common practice**. This practice also encourages farmers to experiment and try out new things. This is a very good way to enhance innovativeness. In the context of climate change, it would be important to introduce in particular more short duration varieties. These help in particular in drought years. A very good source in India is also the international research station ICRISAT located in Hyderabad. Very interesting drought tolerant new varieties of millet, sorghum and various beans can be obtained from there: "[www.icrisat.org/proven-technologies/](http://www.icrisat.org/proven-technologies/)"
- ⊗ A good contact person for organic seed and sustainable agriculture in Pune is Mr. Sujit Charkarbary. He works for the bio-dynamic farming network in India. The contact was made during the final office meeting in Pune.
- ⊗ About half of SSP farmers trained still showed weak adoption rates. Specific messages for these farmers appear necessary. Some measures in this respect are given next.
- ⊗ Strategies for soil fertility for farmers without own livestock is required. This strategy could include more agroforestry and purchasing of organic manure of other farmers. Goats would be a good strategy to start building up own livestock (see livestock).
- ⊗ As long as the market for organic produce doesn't exist, small dosages (max 20kg/acre) of chemical fertilizer application would be acceptable. This is in particular useful for farmers with no own animals and consequently no manure. Appropriate concepts are small doses of fertilizer applied at sowing. This concept can also be looked up at the above ICRISAT site under the name "micro dosing". This strategy promotes better yields with limited costs and limited risks and is much more appropriate than normal high conventional fertilizer recommendations.
- ⊗ Overall, the following general recommendations on keeping soil fertility could be given:
  - a) It is important to return as much animal manure to the fields as possible. Considering, the size of small farms and the small size of animal herds, there is no risk of over-applying too much manure.
  - b) If it is possible to buy organic manure, it is better to buy these, rather than to buy chemical fertilizer.
  - c) If no organic fertilizers can be purchased, using mulching materials would be the next best option. If also these are not available, then small amounts of chemical fertilizer may be purchased. Application rates should not exceed 20kg/acre per nutrient (NPK). In particular higher amounts of urea should be avoided completely, because urea heavily contributes to a reduction in soil humus.
  - d) Planting many fertilizer trees (*Gliricidia*, *faidherbia albida*) will generate good amounts of green fertilizer once these trees are a little bigger (year 3 onward). Using trees even farmers with no animal manure should be able to keep up soil fertility with minimal additional chemical fertilizer inputs. It is best to purchase only PK fertilizers, if any are purchased.



- ⊗ As land is very scarce, planting of farm bunds with trees or fodder grasses is advised.
- ⊗ Several books for further reading on agro ecology and sustainable farming in general were given in the chapter on cropping (see footnote 32, p.67).

### ***Recommendations: Water & watershed thinking***

- ⊗ Water is a crucial resource in semi-arid areas. SSP started to promote water saving drip and sprinkler irrigation systems. This should be expanded. Due to the high price of these systems, SSP should look into ways for subsidising the systems and also look for simple technologies that do not require pumps.
- ⊗ Climate change problems can best be tackled by community level efforts. These include water storage tanks, community wells, farm bunding, water catchment systems etc. In India already considerable funding for this sector is available. However, due to big size of the country, a lot more funding would be desirable. Sound watershed planning activities are required in this respect. SSP should try to help communities to access such funds for example under MNREGA.
- ⊗ In rural areas, many people are already landless. These people often access communal pasture areas. During the field visits, it became obvious that these areas are heavily overgrazed. Organising all social groups in a village, would be an important aspect of village mobilisation. There are many examples of participatory concepts that can be studied in this respect<sup>44</sup>. Larger watershed measures can enhance overall agricultural productivity for many families.
- ⊗ So far SSP has not gained much experience in this technical field but with effects of climate change advancing, it might be an interesting area for further expansion. The Indian NGO HCDI<sup>45</sup> is located in Pune and has a lot of experience in this field. It is supported by Kindernoethilfe and BMZ and might be an interesting collaboration partner for SSP in this field of watershed work.



### ***Recommendations: Trees and agroforestry***

- ⊗ Planting trees is the best climate change adaptation measure. The review workshop showed that women leaders are highly interested in this topic. In particular more fruit trees, fodder and green manure trees would be highly needed. Farmers fear the shade competition of trees. Teaching must focus on proper pruning of trees to maximise the tree benefits. Irrigation of trees in the planting year may be necessary for successful plantation. Besides homesteads, farms bunds could be used for this purpose.
- ⊗ Promote more fruit trees on or near the homesteads.

<sup>44</sup> For example see the work of the south indian NGO Myrada: see [www.myrada.org/films/](http://www.myrada.org/films/) e.g. "watershed1.wmv" Also ICRISAT has plenty of advice on watershed management on the before mentioned website.

<sup>45</sup> Holistic Child Development India, PUNE (HO); Survey No. 4A1/A1/1E, Salunke Vihar Road, Wanowrie, Pune, 411040, Maharashtra, Telephone: +91 20 65000228/229; E-mail: [hcdi@hcdi.in](mailto:hcdi@hcdi.in); <http://www.holisticchild.org/>

- ⊗ Community collaboration on fodder and green manure planting could be tested. The landless population might be willing to plant, water or prune the trees in return for keeping a certain proportion of the fodder or firewood. This could create untapped win/win situation for various social groups in the villages.
- ⊗ Afforestation with fodder trees e.g. *faidherbia albida* could help to upgrade the quality of communal grazing areas. That would benefit the whole of the village.
- ⊗ Introduction of fodder trees such as *Gliricidia*, other local suitable species and in particular *faidherbia albida*<sup>46</sup> should be studied together with KVK. Cashew is another highly suitable multiple purpose tree for semi-arid lands. More advice could also be obtained from the World Agroforestry Centre ICRAF that have a branch in Delhi<sup>47</sup>.
- ⊗ Appropriate firewood saving stoves should be promoted further. So far only LPG stoves seem successful. The current findings indicated very low levels of adoption of new stoves. SSP should study the reasons for this with women in the villages very closely and revise extension approaches accordingly.



### ***Recommendations: Marketing***

- ⊗ During the review workshop, women leaders proposed to work more on joint marketing. They raised the concern that it is not possible for them to brand their products as organic and earn an extra price. Consequently, they reserve the organic production for the family and rather sell the surplus that is not fully organic to the market. Rather than branding their production as organic, they suggest to give it a local regional name and advertise the fact that these products help poor families in drought prone Osmanabad region. Such a "regional branding" is certainly a good idea and worth making an attempt. A key aspect would be to reach a better level of packaging and presentation of their products in order to attract customers and ultimately achieve better prices. An alternative route could be to identify cheaper ways to bring the produce to the market or to reduce the costs involved in marketing their produce by organising the value chain more efficiently. Finding a better price has a lot to do with fully understanding the market and finding a new niche for your products.
- ⊗ Strengthening the existing self-help or farmers groups as indicated in the section on farmer-led development is another strategy that could make marketing more successful. Group marketing is certainly more efficient than individual marketing.
- ⊗ Also consumer habits are changing and the organic movement is growing fast in India. May be in a medium term perspective, the prospects for marketing sustainable agriculture produce become more favourable and creating initiatives

<sup>46</sup> Enda Pronat the Misereor partner in Senegal is promoting this tree species very much. May be a South-South seed exchange could be organised. However, this species should also be available in India from Indian forestry departments or other active NGOs in this domain.

<sup>47</sup> See [www.ICRAF.org](http://www.ICRAF.org) ; or SOUTH ASIA REGIONAL PROGRAMME, 1st Floor, Block C, National Agricultural Science Complex, Dev Prakash Shastri Marg, Pusa Campus, New Delhi 110012; Tel: +91 11 25609800/25847885/6; Email: [v.p.singh@cgiar.org](mailto:v.p.singh@cgiar.org)

for participatory guarantee systems to ensure quality of produce becomes more attractive.

### **Recommendations: Nutrition**

- ⊗ The focus on vegetables and pulses has achieved success in particular for farmers with more land, animals and access to irrigation. Efforts should be given to broaden the scope of activities to reach out more in particular to the poorer households. These still have the biggest nutritional deficits.
- ⊗ The strategy on vegetables showed some weaknesses in particular in respect of drought years. To reduce this problem, the emphasis on fruit trees should be increased. Even in drought years trees can complement diets to some extent. Very easy to cultivate and healthy to eat are Moringa and paw paw. Each home should have at least one tree each.
- ⊗ As already mentioned under the topic "water", access to simple irrigation technologies such as drip irrigation should be facilitated<sup>48</sup>. In addition, measures to collect roof top rainwater could be studied. This water could be used easily for home gardens.
- ⊗ Crop diversity was mentioned under cropping as an important area for further diversification. In this respect, it should be mentioned that in particular root crops are very good for soil fertility and very healthy due to their higher content of protein and vitamins. For example, sweet potato can be used for its tubers, but also the leaves provide very vitamin A rich spinach. The same applies to cassava. In the semi-arid areas root crops are not very wide spread. In more humid South India these root crops are eaten more commonly. However, with a little bit of supplementary irrigation, root crops can be cultivated very successfully also in the semi-arid zones. A dish of root crops consumed at least very fortnight or once a month, would provide a delicious and very healthy supplement to the diet. Root crops are also labour saving, can stay in soil all year, and thus provide a food stock for more difficult times. Traditionally available varieties are always the first choice. But SSP could also try to obtain varieties from the other locations in India where SSP is working. Improved and well yielding drought resistant varieties of root crops are also available through the international research centres CIP<sup>49</sup> reachable via their Deli branch office.
- ⊗ Farmers and SSP need to advocate for healthy nutrition openly and visible. Due to modern food habits, more and more traditional knowledge on good food, how to prepare it and where to get it gets lost. SSP can build on its good network of health workers and links to Government services to advocate for healthy nutrition. Leaflets on sources for good food and recommendations by doctors are the cheapest and most efficient way of marketing important ideas. Also in Europe, the green movement expanded much by mouth to mouth propaganda of health related professionals.

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<sup>48</sup> An interesting organisation is IDEI: see [www.ide-india.org/](http://www.ide-india.org/).

<sup>49</sup> CIP (international Potato center) South and West Asia office in India: c/o IARI Campus, New Delhi 110012, Mail: CIP-deli@cnet.com

## ***Recommendations: Diffusion of extension messages***

- ⊗ Supporting farmers to adopt sustainable agriculture practices takes a longer time period and experience has shown that a single project funding period is not sufficient. In Uganda, a six-year period was very suitable to achieve good adoption results. Training is very intensively in the first three years with the focus on sustainable practices, and then, a second three-year phase can be used to consolidate achievements, scale-up production further, support and link up with marketing and gradually phase out so that farmers can support themselves: Finally, groups can be linked with national organic movements for a continued contact with the latest developments in the sector.
- ⊗ In India it is quite common that organisations work with a very big number of farmers to be trained. The higher the number, of course, the more difficult it is to provide intensive hands-on training. In Africa, Misereor partners train smaller number of households but more intensively. May be SSP could also test such a more intensive training approach. May be this should be done in particular in a first funding phase, and then, in a second phase a stronger scaling-up to more farmers could be tested. A focus of the methodology could be also on creating good adopters in the first place that can then become farmer trainers for others later on. Such a farmer-led system showed very good benefits in the Philippines<sup>50</sup>. Farmers are generally the better extension agents. They speak farmers' language and can express matters in a simpler way for people to understand easier. But a key aspect of MASIPAG's approach is to let farmers select themselves, those, that are the best practitioners of innovations. These farmers can show the practices on their own farm, they can talk about their experience how they managed to produce the changes that can be observed. There is nothing more convincing than the authentic story of a practitioner, the possibility to learn how and why to do certain things and to know what are the tricks to make it work successfully. SSP is already using elements of this approach; it is just a matter of creating a broader base of farmer trainers.
- ⊗ Extension visits should be better planned and monitored. Such a systematic approach should help to reduce the current bias towards better adaptors. It should be attempted that a high percentage of all farmers benefit equally.
- ⊗ Misereor partners in Uganda developed a project monitoring system (result based monitoring) that allows measuring the progress made with focus on sustainable agriculture goals. Developing a similar system could also benefit the work of SSP in India.
- ⊗ Misereor partner in Uganda also developed a "Participatory Impact Monitoring - PIM". This approach helps in particular farmers or groups to make more progress. The groups need to set their own goals, manage group processes better and monitor individual or group progress towards goals by themselves. Such a system helps farmers to stand on their own feet; it encourages more adoption and therefore supports project goal achievement<sup>51</sup>. If needed further assistance on result based project M&E or PIM can be provided by the consultant.

<sup>50</sup> For more details look up the Masipag website: [www.masipag.org](http://www.masipag.org). Here, you find a publication: "Food security and farmer empowerment".

<sup>51</sup> See Germann, D. und Gohl, E. 1996: Participatory Impact Monitoring. 4 Booklets. <http://www.fakt-consult.de/content/publications-participatory-impact-monitoring-pim>.

Also see Schürmann Anke (2002): Participatory impact monitoring of self-help groups and watersheds. Based on field experiences and workshop contributions from Myrada. Deutsche Welthungerhilfe. [www.myrada.org](http://www.myrada.org)

- ⊗ SSP works very closely with government services in the health and agricultural sector. This close cooperation is certainly a key element of the success of the work. These linkages should be developed further. Periodically, SSP should sit together with its Government partner and discuss/ review extension approaches with a view to improving the impact of programmes.

### ***Recommendations: Lobbying***

- ⊗ The concept of SSP to combine extension on sustainable farming with a strong focus on women empowerment and by linking NGO staff in a synergistic way with Government services has shown remarkable impact for poor rural families. Considering that the environmental context of severe drought, these findings are ever more noteworthy. SSP should use the findings to lobby for further support towards this concept on the national scale.
- ⊗ SSP could try to join forces with the sustainable agriculture or organic movements in India. This could be a rewarding learning opportunity for SSP and it could provide for a broader lobbying base for these sound innovative farming concepts.
- ⊗ The study provides a wide range of empirical evidence that SSP's strategy to support sustainable agriculture with a focus on nutrition security first leads to good impacts for families in the study region of Maharashtra, India. This indicates that the concept would also be useful for a broader replication in India. Similar results on the approach were obtained in the Philippines, Uganda and Brazil. These findings should be made available to a broad audience in Germany and the countries in the global south.
- ⊗ In order to improve the situation on food security, India has set up the public distribution system (PDS) for food grains. This system has certainly helped to avoid a major famine in the current years of extreme drought in the study region. However, the low prices of basic food items also have its side effects by creating little price incentives for farmers to produce. Lobbying work seems necessary to improve on the weaknesses of the PDS system. In particular drought resistant local grains such as millets and sorghum should be given a higher priority for distribution. In addition protein rich foods and fresher foods containing essential vitamins are needed. Better monitoring of who is accessing the benefits of PDS appears necessary.
- ⊗ National lobbying to fight for reduced greenhouse gas emissions is highly needed. The drought effects show how in particular the rural poor suffer from this global problem. In the course of the Paris 2015 global agreement it should become easier to lobby for more appropriate policies in India. Here are just a few problems and potential solutions:
- ⊗ There is still a high promotion of coal burning for electricity. Bore wells are run on electric pumps that use subsidised electricity coming from coal burning! India needs to exit coal burning much sooner than currently planned.
- ⊗ LPG gas is subsidised although it is not a renewable energy and contributes to global warming.
- ⊗ Sustainable agriculture relies on agroforestry to large extends. As this is costly and labour intensive in the start-up phase, appropriate subsidies would be needed. Efforts should be undertaken to lobby for national subsidies or international support.

## References

- Agricultural census division. "All India Report on Number and Area of Operational Holdings." New Delhi, 2010-11.
- Anjani kumar, Shinoj Parappurathu, M C S Bantilan, P.K. Joshi.(n.d.): "Public Distribution System in India: Implications for Poverty and Food Security."
- Bachmann 2013: Process Review of designing M&E systems for Sustainable Agriculture in Uganda. Evaluating data sets. Finalising procedures. Misereor Evaluation report.
- Bachmann, L. and Kiguli, D. (2016): 20 years of Sustainable Agriculture in Uganda. Second household impact survey of Misereor partners. Comparing SA with conventional farmers and tea outgrowers. Evaluation code 1993-Z1031-1004.Final report. Misereor Aachen.
- Bachmann, L., 2005. Impact household survey. Ten years work of Misereor partners on sustainable and organic agricultural practices. Final Report. Misereor. Aachen
- Bachmann, L., Cruzada E., Wright S., 2009. Food security and farmer empowerment. A study of the impacts of farmer-led sustainable agriculture in the Philippines. Misereor. [www.Masipag.org](http://www.Masipag.org)
- Bennett, E. Carpenter, S. Gordon, L. Ramankutty, N. Balvanera, P. Campbell, B. Cramer, W. Foley, J. Folke, C. Karlberg, L. Liu, J. Lotze-Campen, H. Mueller, N. Peterson, G. Polasky, S. Rockström, J. Scholes, R. Spierenburg, M. 2014. Toward a More Resilient Agriculture. Solutions. Vol 5, No. 5. pp. 65-75; <http://www.thesolutionsjournal.com/node/237202>
- R. Biggs, M. Schlüter, M. Schoon (ed.) 2015: Principles for Building Resilience. Sustaining Ecosystem Services in Social-Ecological Systems. Cambridge University press.
- Bhattacharyya, T., D.K. Pal, P. Chandran, (Mrs.) C. Mandal, S.K. Ray, R.K. Gupta and K.S. Gajbhiye. (2004): Managing Soil Carbon Stocks in the Indo-Gangetic Plains, India, Rice-Wheat Consortium for the Indo-Gangetic Plains, New Delhi-110 012, India. pp 44
- CH. Srinivasarao<sup>1</sup>, B. Venkateswarlu, R. Lal, A. K. Singh, S. Kundu, K. P. R. Vittal, J. J. Patel and M. M. Patel (2011): LONG-TERM MANURING AND FERTILIZER EFFECTS ON DEPLETION OF SOIL ORGANIC CARBON STOCKS UNDER PEARL MILLET-CLUSTER BEAN-CASTOR ROTATION IN WESTERN INDIA. Land Degradation & Development, Volume 25, Issue 2, pages 173–183, March/April 2014
- IPPC (2014): Climate Change Synthesis Report. Summary for Policymakers. IPCC. Switzerland.
- Data sources (2016): Rainfall data; [www.indiawaterportal.org/met\\_data/](http://www.indiawaterportal.org/met_data/)
- Dhyani, S.K. (2014): "National agroforestry policy 2014 and the need for area estimation under agroforestry." Current Science 107 (July 2014).
- Directorate of Economics and Statistics (2013): Economic survey of Maharashtra. Planning department, government of Maharashtra, 2013-14.
- Exchange rate calculations: [www.fxtop.com](http://www.fxtop.com)
- FAO (2010): Nutrition country profile for India 2010.
- FAO (2017): [FAO.org](http://FAO.org); Data of the FAO statistical online database. [www.fao.org/faostat/en/#country/100](http://www.fao.org/faostat/en/#country/100)
- FAO nutrition country profile for India 2010
- FAO, IFAD, World Food Programme (n.d.). The state of food insecurity in the World.

- Germann, D. und Gohl, E. 1996: Participatory Impact Monitoring. 4 Booklets. [www.fakt-consult.de/content/publications-participatory-impact-monitoring-pim](http://www.fakt-consult.de/content/publications-participatory-impact-monitoring-pim) [accessed 13.6.2017]
- GOv of Mah. Planning Department (2013): Report of the high level committee on "balanced regional developmenmt in Maharastra"
- Government of India Ministry of water ressorces (2013): Central ground water board information, Osmanabad District, Maharastra, 1758/DBR/2013.
- I.P.Abrol. (n.d.): "Agriculture in India." Center for advancement of sustainable agriculture.
- IIPS/India (2007): India National Family Health Survey (NFHS-3) 2005-06. [https://en.wikipedia.org/wiki/Indian\\_states\\_ranking\\_by\\_household\\_size](https://en.wikipedia.org/wiki/Indian_states_ranking_by_household_size)
- IIRR (1998): Sustainable Agriculture extension manual for Eastern and Southern Africa. Nairobi.
- International Institute of Population Sciences (2006): National family Health Survey -3. Mumbai, 2005-06.
- International Institute of Population Sciences (2012):Comprehensive nutritional study in Maharashtra.
- IPES-Food ( 2016): From uniformity to diversity: a paradigm shift from industrial agriculture to diversified agroecological systems. International Panel of Experts on Sustainable Food systems. [www.ipes-food.org](http://www.ipes-food.org)
- IPPC, 2014. Climate change 2013. The physical science base. 5th Assessment report. Intergovernmental panel on climate change. <https://www.ipcc.ch/report/ar5/>
- J.A. Foley, N. Ramankutty, K.A. Brauman, E.S. Cassidy, J.S. Gerber, M. Johnston, N.D. Mueller, C. O'Connell, D.K. Ray, P.C. West, C. Balzer, E.M. Bennett, Carpenter S.R., J. Hill, C. Monfreda, S. Polasky, J. Rockström, J. Sheehan, S. Siebert, D. Tilman, D.P.M. Zaks (2011). Solutions for a cultivated planet. *NATURE*, 478, pp.337-342.
- Macro, International Institute for Population Sciences (IIPS) and. National Family Health Survey (NFHS-3), 2005-2006. Maharashtra, Mumbai: IIPS, 2005-2006.
- Ministry of environment and forests (2014): Elucidation of fifth national report. Dehradun: Indian Council of Forestry Research & Education (ICFRE)
- Ministry of environment, forest and climate change, Dehradun, (2015): India, Forest Survey of. "State of Forest report 2015."
- Misereor 2010: Strengthening people-led development. A joint effort of local communities, NGOS and donors to redefine participation. "
- National Institute for Nutrition (2011): D dietary guidelines for Indians. Hyderabad, 2011.
- National Institute of nutrition (2011): Dietary guidelines of Indians, Hyderabad
- Nicholls Clara I., Altieri Miguel A., Salazar Alejandro H. and Lana Marcos A. 2015. Agroecologia e o desenho de sistemas agrícolas resilientes às mudanças climáticas. *Revista Agriculturas: experiências em agroecologia*. CADERNOS PARA DEBATE No. 2. AS-PTA. Rio de Janeiro.
- OANDA (2015): Source for exchange rates. (<http://www.oanda.com/>)
- Ravindra H. Dholakia. Manish B. Pandya, Payal M. Pateriya (2013): Urban – Rural Income Differential in Major States: Contribution of Structural Factors, , W.P. No. 2014-02-07. February 2014
- Research Department of Economic Analysis and Agricultural Land holdings pattern in India. Department of economic analysis and research, NABARD, NABARD, 2014.
- Resilience Alliance. 2010. Assessing resilience in social-ecological systems: Workbook for practitioners. Version 2.0. Online: <http://www.resalliance.org/3871.php>

- Rockström, J., W. Steffen, K. Noone, Å. Persson, F. S. Chapin, III, E. Lambin, T. M. Lenton, M. Scheffer, C. Folke, H. Schellnhuber, B. Nykvist, C. A. De Wit, T. Hughes, S. van der Leeuw, H. Rodhe, S. Sörlin, P. K. Snyder, R. Costanza, U. Svedin, M. Falkenmark, L. Karlberg, R. W. Corell, V. J. Fabry, J. Hansen, B. Walker, D. Liverman, K. Richardson, P. Crutzen, and J. Foley. 2009. Planetary boundaries. Exploring the safe operating space for humanity. *ECOLOGY AND SOCIETY* 14(2): 32. [online] URL: <http://www.ecologyandsociety.org/vol14/iss2/art32/>
- Sarika D. Patil, Sen. T.K, Chatterji. S, Sarkar. D and Handore. R.M (2014): Changes in soil organic carbon stock as an effect of land use system in Gondia district of Maharashtra. *INTERNATIONAL JOURNAL OF ENVIRONMENTAL SCIENCES*, Volume 5, No 2, 2014
- Schürmann Anke (2002): Participatory impact monitoring of self-help groups and watersheds. Based on field experiences and workshop contributions from Myrada. Deutsche Welthungerhilfe. [www.myrad.org](http://www.myrad.org)
- Sengupta, Roopam Singh and Ranja. "The EU India FTA in Agriculture and Likely Impact on Indian Women." Centre for Trade and Development and Heinrich Boell Foundation, New Delhi, 2009.
- SSP 2013: Baseline report Maharashtra by Bhushana - Draft SSP 25 March 2013. SSP document.
- Start up (2014): Building Women's Leadership And Entrepreneurship For Effective Local Action In Health, Agriculture And Nutrition In A Changing Climate And Environment In Gujarat And Maharashtra States In India. Draft Mid-Course Evaluation.
- Stockholm Resilience Centre (2016): Applying resilience thinking. Seven principles for building resilience in socio-ecological systems. [www.stockholmresilience.se](http://www.stockholmresilience.se)
- Strassburg A (2010): Ernährungserhebung Methoden und Instrumente. *Ernährungs Umschau* 8/2010
- Sustainable Agriculture extension manual for Eastern and Southern Africa. (IIRR 1998)
- Thematic Expert for 2030 Agenda for Sustainable Development (Romania)
- UNEP (2016): IRP Report Calls for "Resource-Smart" Food Systems. Unep press release. Ana Maria Lebeda. <http://sdg.iisd.org/news/irp-report-calls-for-resource-smart-food-systems/>
- UNICEF. "Comprehensive Nutrition Survey in Maharashtra ." survey report, UNICEF, 2012.
- Welthungerhilfe (2014): Welthungerindex. Bonn.
- World Bank (2015): Development Goals in an Era of Demographic Change. Global Monitoring Report | 2015/2016



## Appendix 1: Detailed data tables

**Table 41: Family size categories**

	Number of family members							
	1-2	3	4	5	6	7	8-9	10-15
Reference %	9.0	10.5	26.0	24.0	14.0	9.5	3.0	4.0
SSP %	7.5	16.5	24.0	26.5	14.0	6.5	3.0	2.0

**Table 42: Overview on income in percentiles (Rs.)**

	Percentiles						
	5	10	25	50	75	90	95
<b>Value home consumption</b>							
Reference	1,310	4,305	9,825	18,333	34,738	54,080	62,685
SSP	5,005	7,150	15,494	30,553	45,499	57,371	70,595
SSP/Ref %	282%	66%	58%	<b>67%</b>	31%	6%	13%
<b>Off-farm income</b>							
Reference	0	12,000	35,000	79,400	127,000	220,000	320,000
SSP	75	14,500	40,500	80,000	139,000	203,000	309,000
SSP/Ref %	Na	21%	16%	<b>1%</b>	9%	-8%	-3%
<b>Farm income</b>							
Reference	0	1,500	9,600	26,500	62,900	124,000	229,000
SSP	2,080	8,525	20,200	47,400	97,800	175,000	266,000
SSP/Ref %		468%	110%	<b>79%</b>	55%	41%	16%
<b>Grand total income</b>							
Reference	41,140	59,700	86,125	135,780	215,000	368,880	597,903
SSP	60,276	78,156	113,175	172,200	259,439	422,973	527,739
SSP/Ref %	47%	31%	31%	<b>27%</b>	21%	15%	-12%

**Table 43: Off-farm income in percentiles (Rs.)**

	Group	5	10	25	50	75	90	95
Small businesses	Reference	0	0	0	0	0	59,600	96,000
	SSP	0	0	0	0	0	77,400	120,000
Remittances	Reference	0	0	0	0	0	12,000	36,000
	SSP	0	0	0	0	0	49,800	100,000
Employment or pensions	Reference	0	0	0	0	0	82,800	166,000
	SSP	0	0	0	0	3,600	74,900	120,000
Casual labour	Reference	0	0	3,125	23,800	60,000	90,000	120,000
	SSP	0	0	0	20,000	46,900	74,100	99,800
Other sources?	Reference	0	0	0	0	25,000	69,800	100,000
	SSP	0	0	0	0	23,000	71,800	100,000
Total off-farm income	Reference	0	12,000	35,000	79,400	127,000	220,000	518,000
	SSP	0	14,500	40,500	80,000	139,000	203,000	539,800

**Table 44: Relation of production factors land and livestock on total household income including subsistence value ( Rs. ). Low, medium and upper percentiles.**

Production factors	P25		P50		P75		N	
	Reference	SSP	Reference	SSP	Reference	SSP	Reference	SSP
Land								
< =1 acre	79.450	88.655	99.625	143.068	155.120	262.149	32	20
>1<=2 acres	82.500	109.675	122.500	160.100	189.600	224.175	87	89
> 2 acres	108.595	123.950	180.000	210.580	264.798	301.953	81	91
Livestock								
Cows = 0	83.350	96.825	124.045	158.000	190.225	240.503	108	85
Cows 1-2	76.600	124.388	143.950	186.085	214.586	283.025	57	72
Cows >= 3	111.750	142.730	189.600	219.900	291.950	298.615	35	43

**Table 45: Source of farm income in percentiles ( Rs.)**

		50	75	90	P90 in % of total
Crops	Reference	12,000	30,000	63,200	51
	SSP	24,100	54,600	95,700	52
Milk	Reference	0	14,600	25,200	21
	SSP	3,600	26,600	54,700	30
Animal sales	Reference	0	0	30,000	24
	SSP	0	1,375	27,900	15
Eggs and poultry	Reference	0	0	0	0
	SSP	0	0	0	0
Other products, e.g, timber	Reference	0	0	4,400	4
	SSP	0	0	7,000	4

**Table 46: Calendar and type of village visit with qualitative method focus**

Date	PRA	IDT	Reached	Village	Notes
12.4	X		15		Reconnaissance visit
18.4		X	2	Chiwari	+Pretest, 1 good , 1 bad case, adolescent girl story, Grapes in the field
20.4	X		5-8	Tirth	SSP financed house, Graam parishad, Andre present
22.4			2		Pretest uphill watershed, poorest lady
22.4	X		10	Densinga (Tupur BI)	Evening session, lady won prices, special chicken race
25.4		X	4	Medsinga	Manila lamp, mill, house construct
26.4		X	2	Kini	Kompost, small place, 2 woman same place, test recommendations

**Table 47: Household expenditure for non-food items in 2015 ( Rs.)**

Non food expenses		5	10	25	50	75	90	95
Value of major functions (marriage etc)	Ref.	0	0	0	0	0	4,850	200,000
Value of major functions (marriage etc)	SSP	0	0	0	0	0	0	11,900
Health care and medical	Ref.	25	1,000	2,000	5,000	15,000	40,000	79,500
Health care and medical	SSP	0	500	2,000	5,000	11,500	30,000	49,500
Education	Ref.	0	0	0	1,000	10,000	22,300	40,000
Education	SSP	0	0	0	2,500	10,000	30,000	59,200
Contributions to ceremonies/funerals	Ref.	0	0	1,000	2,000	3,000	10,000	39,200
Contributions to ceremonies/funerals	SSP	0	0	1,000	2,000	3,000	8,000	15,000
Drinks and leisure	Ref.	0	0	0	0	2,000	14,700	23,900
Drinks and leisure	SSP	0	0	0	0	2,000	14,200	23,700
Clothing	Ref.	2,000	3,000	5,000	7,000	10,000	15,000	17,800
Clothing	SSP	2,000	3,000	5,000	7,000	10,000	12,000	15,900
Other expenditure	Ref.	0	0	0	0	500	4,000	18,000
Other expenditure	SSP	0	0	0	0	1,000	4,900	11,900
Consumption expenses (radio, TV, etc.)	Ref.	0	0	0	0	1,150	2,000	5,000
Consumption expenses (radio, TV, etc.)	SSP	0	0	0	0	1,800	6,980	18,000
Transportation costs	Ref.	0	0	1,000	2,000	4,950	6,000	10,000
Transportation costs	SSP	0	0	500	2,000	5,000	7,000	10,000
Mobile bills	Ref.	0	364	1,000	1,200	2,400	3,600	6,000
Mobile bills	SSP	0	600	1,000	1,450	3,000	6,000	8,910
Insurances	Ref.	0	0	0	0	0	1,470	5,000
Insurances	SSP	0	0	0	0	0	3,450	6,950
Energy, kerosene, electricity	Ref.	0	500	810	2,000	3,000	4,000	4,990
Energy, kerosene, electricity	SSP	258	510	1,200	2,000	2,829	3,600	4,778
Taxes	Ref.	0	0	0	0	0	600	1,000
Taxes	SSP	0	0	0	0	400	600	1,380
Housing costs	Ref.	0	0	0	0	238	600	1,000
Housing costs	SSP	0	0	0	0	250	600	900
Water	Ref.	0	0	0	0	0	0	0
Water	SSP	0	0	0	0	0	0	0
Household loans	Ref.	0	0	0	0	0	0	0
Household loans	SSP	0	0	0	0	0	0	0

**Table 48: Expenditure for all household food items ( Rs.)**

Food items		5	10	25	50	75	90	95
Salt, sugar, cooking oil, soap	Ref,	1,557	7,000	12,000	18,000	24,000	28,700	36,000
Salt, sugar, cooking oil, soap	SSP	5,050	9,048	12,000	18,000	24,000	30,000	36,000
Meat, fish and eggs	Ref,	0	0	0	3,180	7,150	14,400	18,000
Meat, fish and eggs	SSP	0	0	0	2,510	6,540	12,000	15,000
Vegetables	Ref,	253	1,000	2,400	4,800	7,200	9,600	11,900
Vegetables	SSP	0	0	1,525	4,800	6,000	9,600	9,600
Milk	Ref,	0	0	0	2,045	5,400	7,957	10,800
Milk	SSP	0	0	0	0	3,600	7,200	10,900
Pulses	Ref,	0	0	840	2,295	4,200	6,400	7,500
Pulses	SSP	0	0	0	1,800	3,600	5,040	7,500
Groundnut	Ref,	2	1,050	1,698	3,000	3,840	4,800	6,704
Groundnut	SSP	0	1,050	1,680	2,800	3,840	5,040	6,720
Millets (Jowar)	Ref,	0	0	0	0	2,000	4,000	5,485
Millets (Jowar)	SSP	0	0	0	0	2,000	4,000	5,980
Rice	Ref,	90	120	216	360	1,200	2,940	4,491
Rice	SSP	90	120	200	360	1,000	1,800	2,390
Wheat	Ref,	0	0	288	600	2,400	6,000	7,485
Wheat	SSP	0	0	204	480	2,000	4,980	7,455

**Table 49: Land use in 2016 in acres (percentiles)**

Type of land use		5P	P10	P25	P50	P75	P90	P95
Land owned	Reference	0.634	1	1.5	2	2.5	3	3
	SSP	1	1.005	2	2	3	3	3
Land bought (last 5 years)	Reference	-	-	-	-	-	-	-
	SSP	-	-	-	-	-	-	-
Land sold last 5 years	Reference	-	-	-	-	-	-	-
	SSP	-	-	-	-	-	-	-
Land leased to other farmers	Reference	-	-	-	-	-	-	-
	SSP	-	-	-	-	-	-	-
Fallow of at least 1 year	Reference	-	-	-	-	-	-	0.5
	SSP	-	-	-	-	-	-	0.5
Forest or woodlot	Reference	-	-	-	-	-	-	-
	SSP	-	-	-	-	-	-	-
Total land cultivated	Reference	1	1	1.5	2	2.5	3	3
	SSP	1	1	2	2	3	3	3

**Table 50: Biodiversity and percentile groups**

Species		P10	P50	P90
Total trees	Ref.	1	4 <sup>a) ns</sup>	12
	SSP	1	4 <sup>a)*</sup>	11
Total crops	Ref.	2	5 <sup>b)*</sup>	13
	SSP	2	6 <sup>b)*</sup>	13
Biodiversity total	Ref.	4	10 <sup>c) ns</sup>	24
	SSP	4	11 <sup>c) ns</sup>	24

a) not significant (ns) sig 0,593; b) \*significant: log transformed data sig 0,042; c) not significant sig 0,378

**Table 51: How do you view your income change before/after the project?**

% households rating their situation	Reference	SSP	Reference	SSP
	Off-farm income		Farm income	
Decrease	30.0	24.0	64.5	47.5
The same	36.5	27.5	26.0	26.0
Better	30.0	37.5	9.0	24.0
Much better	3.5	11.0	0.5	2.5

**Table 52: Rural and urban income disparities**

	Rural	Urban
Maharashtra	53,369	168,178
Andra Pradesh	54,261	120,593
Bihar	20,800	58,336

Ravindra H. Dholakia et al. (2014)

**Table 53: Area and yield estimates for most widely grown crops (medians)**

1 acre = 40R)	Reference			SSP			Yield difference %	Yield KVK <sup>1)</sup> kg/ha
	No. Farmers	Total area R	Yield per acre	No. Farmers	Total area R	Yield per acre		
		R	kg/a		R			
<b>Grains</b>								
Soy bean	126	50	200	129	40	350	75%	438
Sorghum	147	40	225	143	40	300	33%	346
Wheat	46	20	300	73	20	300	0%	706
Bengal gram	89	20	200	116	20	200	0%	
Pigeon Pea	47	20	100	57	10	400	300%	284
Cluster bean	11	2,9	310	41	2	500	61%	
Black gram	43	16,25	123	78	10	80	-35%	285
Green gram	58	15	133	91	10	100	-25%	213
<b>Vegetables</b>								
Spinach/Palak	12	1,5	800	43	1,5	1333	67%	
Fenugreek/Methi	18	1	800	48	2	800	0%	
Eggplant/Brinjal	13	2	1000	46	2,25	711	-29%	
Ladies Finger	12	2	530	38	2	550	4%	
Coriander	17	2,4	500	44	2	600	20%	
Chillies	10	2,5	240	42	2	500	108%	
<b>Total</b>	<b>649</b>			<b>989</b>				
<b>Average</b>	<b>46,4</b>	<b>13,4</b>		<b>70,6</b>	<b>11,7</b>		<b>41%</b>	

<sup>1)</sup> Data of KVK for 2014, pers. Communication

Soya yields appear surprisingly high for drought

In Maharashtra the yield 808 Kg per hectare during Kharif 2014, SOPA estimates <http://www.thecropsite.com/news/17010/indias-soybean-kharif-yield-up-2170-per-cent-in-2014/>

**Table 54: Crop production data for less widely grown minor crops (medians)**

	Reference						SSP					
	No. Farmers	Total Area	Total production	Own consumption	Yield per acre	Yield per ha	No. Farmers	Total Area	Total production	Own consumption	Yield per acre	Yield per ha
		R	Kg	Kg	kg/a	kg/ha		R	Kg	Kg		
Onion	35	30	1100	50	1466.67	3666.67	68	18.8	450	77.5	960	2400
Lin seed	8	8.5	4.5	4.5	21	53	28	4.5	6	4.5	53	133
Sesame	5	2	25	10	500	1250	27	5	15	15	120	300
Maize	11	10	50	0	200	500	26	10	55	17.5	220	550
Tomato	6	2.9	87.5	20	1207	3017	22	2	40	17.5	800	2000
Sugar cane	16	80	8500	0	4250	10625	14	85	10500	0	4941	12353
Pearl millet (Bajra)	2	17.5	90	65	206	514	13	7.7	50	50	260	649
Safflower	7	10	40	10	160	400	12	3.5	8.5	5	97	243
Ground nut	6	15	100	90	267	667	9	10	50	50	200	500
Moth bean (sprouted)	3	10	20	10	80	200	7	8.5	14	5	66	165
Green peas	1	5	-	-	-	-	7	5	5	2	40	100
Mustard	0		-	-	-	-	7	2	5	5	100	250
Bottle gourd	1	1.6	-	-	-	-	6	4.5	4.5	2	40	100
Rajgira	0	-	-	-	-	-	5	1	50	50	2000	5000
Grapes	1	-	-	-	-	-	5	120	10000	0	3333	8333
Bitter gourd	0	-	-	-	-	-	4	1.3	5	1	154	385
Sunflower	2	30	100	25	133	333	3	10	50	5	200	500
Cabbage	0	-	-	-	-	-	3	0.5	20	10	1600	4000
Floriculture	1	33	1335	0	1618.18	4045.45	3	5.5	177.5	5	1291	3227
Rice	4	20	150	150	300	750	2	30	350	300	467	1167
Capsicum	1	6	12	6	80	200	1	4	10	10	100	250
<b>Total production</b>	<b>57</b>		<b>679</b>	<b>390.5</b>			<b>182</b>		<b>738</b>	<b>549.5</b>		

**Table 55: Average application rates for farmers using inputs (only 20-30% of farmers)**

	Reference kg	SSP kg
NPK	42	65
Urea	111	93
DAP	144	129
Single super P	32	32

**Table 56: Percentage of households owning assets in 2015**

	Reference %	SSP %	Advantage SSP %
<b>Household assets</b>			
Phone, mobile	95.0	98.0	3.0
Television	62.6	65.3	2.7
Bicycle	39.4	39.3	-0.1
Motor bike	33.3	41.3	8.0
Sewing machine	15.7	22.5	6.8
Fridge	12.6	14.8	2.2
Second farm house	4.0	4.6	0.6
Motor car	3.0	1.5	-1.5
Solar products	1.5	4.1	2.6
Auto (tricycle)	0.5	0.5	0.0
<b>Farm assets</b>			0.0
Stable for cows	22.7	32.7	<b>10.0</b>
Seed or fertilizer drill	22.2	20.9	-1.3
Plough	19.7	22.5	2.8
Sprayer	17.7	22.5	<b>4.8</b>
Bullock cart	16.7	19.4	2.7
Stable for goats	6.1	7.7	1.6
Thresher	3.0	0.0	-3.0
Poultry shed	3.0	2.6	-0.4
Tractor	2.0	0.0	-2.0
Farm storage structure	2.0	2.6	0.6

**T****Table 57: Pure stand and intercropping**

Crops	Reference		SSP	
	Pure	Intercropped	Pure	Intercropped
Q45dA. (P/i) Rice	100%	0%	100%	0%
Q45nA. (P/i) Sugarcane	100%	0%	100%	0%
Q45acA. (P/i) Grapes	100%	0%	100%	0%
Q45IA. (P/i) Soy bean	99%	1%	98%	2%
Q45cA. (P/i) Wheat	93%	7%	92%	8%
Q45aA. (P/i) Sorghum	91%	9%	90%	10%
Q45arA. (P/i) Groundnut	86%	14%	67%	33%
Q45gA. (P/i) Bengal Gram	49%	51%	51%	49%
Q45zA. (P/i) Onion	71%	29%	43%	57%
Q45bA. (P/i) Pearl millet	50%	50%	41%	59%
Q45fA. (P/i) Pigeon Pea	38%	63%	37%	63%
Q45axA. (P/i) Floriculture	67%	33%	33%	67%
Q45eA. (P/i) Maize	27%	73%	31%	69%



Q45qA. (P/i) Bitter Gourd	0%	100%	30%	70%
Q45atA. (P/i) Safflower	14%	86%	27%	73%
Q45iA. (P/i) Black gram	42%	58%	26%	74%
Q45afA. (P/i) Sunflower	50%	50%	25%	75%
Q45hA. (P/i) Green gram	41%	59%	24%	76%
Q45kA. (P/i) Green Peas	0%	100%	14%	86%
Q45auA. (P/i) Sesame	0%	100%	13%	90%
Q45uA. (P/i) Cluster beans	18%	82%	13%	88%
Q45jA. (P/i) Moth bean	33%	67%	10%	90%
Q45yA. (P/i) Ladies finger	10%	90%	9%	91%
Q45asA. (P/i) Linseed	10%	90%	9%	91%
Q45rA. (P/i) Bottle gourd	0%	100%	8%	92%
Q45abA. (P/i) Spinach/Palak	23%	77%	8%	92%
Q45vA. (P/i) Coriander	9%	91%	7%	93%
Q45xA. (P/i) Fenugreek/Methi	15%	85%	7%	93%
Q45tA. (P/i) Chillies	16%	84%	6%	94%
Q45aaA. (P/i) Tomato	27%	73%	6%	94%
Q45wA. (P/i) Eggplant/Brinjal	12%	88%	5%	95%
Q45sA. (P/i) Cabbage	0%	0%	0%	100%
Q45adA. (P/i) Capsicum	0%	100%	0%	100%
Q45aeA. (P/i) Rajgira	0%	0%	0%	100%
Q45avA. (P/i) Mustard	0%	0%	0%	100%

**Table 58: Adoption level for improved practices**

Improved practices	Adoption level Reference %					Adoption level SSP %				
	0	1/4	1/2	3/4	4/4	0	1/4	1/2	3/4	4/4
Germination testing	73	1	1	1	24	26	5	18	7	46
Intercropping/Mixed cropping	26	8	34	1	31	22	3	26	7	44
Soil testing	73	5	5	2	15	28	6	19	5	43
Seed inoculation	61	0	4	0	35	39	2	13	4	43
Utilisation of own seeds	29	7	38	6	20	20	3	31	6	41
Cultivation of food crops	45	11	22	1	22	35	4	19	3	39
Cultivation of vegetables	49	18	19	5	9	31	8	19	4	39
Cultivation of fodder	70	11	8	2	8	49	8	9	3	32
Biodynamic compost and vermi compost	63	0	10	0	27	53	6	8	2	31
Organic pest control	95	1	1	0	2	61	8	5	2	26
Farm bunding (entire farm)	93	5	1	1	0	70	2	10	3	16
Cultivation of Azolla	99	0	0	0	1	81	2	2	1	15
Cultivation of fodder (Hydroponics)	99	0	1	0	0	80	3	3	1	13
Average	67	5	11	1	15	46	5	14	4	33

**Table 59: Chemical fertilizers use percentiles kg per farm**

Type of fertilizer	Group	P5	P10	P25	P50	P75	P90	P95
NPK	Reference	0	0	0	0	0	100	135
	SSP	0	0	0	0	50	175	275
Single Super phosphate	Reference	0	0	0	0	0	60	100
	SSP	0	0	0	0	0	100	150
DAP	Reference	0	0	50	100	100	200	285
	SSP	0	0	50	100	100	250	400
Urea	Reference	0	0	0	50	100	150	235
	SSP	0	0	0	100	100	200	200
Micronutrients	Reference	0	0	0	0	0	0	0
	SSP	0	0	0	0	0	0	0

**Table 60: Changes in food diets in the last 5 years**

Food items	Category	Eat more %	Eat the same %	Eat less %	n.a. %
Wheat	Reference	66	31	4	-
	SSP	62	36	2	-
Rice	Reference	61	38	2	-
	SSP	58	39	3	-
Millets	Reference	45	43	12	-
	SSP	52	37	11	-
Groundnuts	Reference	57	41	2	-
	SSP	53	45	2	-
Pulses	Reference	50	47	3	-
	SSP	51	46	3	-
Vegetables	Reference	49	45	7	-
	SSP	52	44	5	-
Fruits	Reference	20	65	15	-
	SSP	21	66	13	-
Eggs	Reference	17	41	18	25
	SSP	17	34	20	29
Meat	Reference	20	40	16	25
	SSP	17	39	15	29
Milk and dairy products	Reference	44	42	15	-
	SSP	47	45	7	-
Fish	Reference	14	22	22	43
	SSP	9	21	21	50

**Table 61: Own and purchased food consumption per person for central and upper percentile groups and national recommendations**

	Recommendation in kg annum	P50 kg and (%)				P75 kg and (%)			
		Own		Purchased		Own		Purchased	
		Ref.	SSP	Ref.	SSP	Ref.	SSP	Ref.	SSP
Cereals & Millets	149	38	47	61	59	69	87	105	105
Pulses and non-veg food	30	4	16	7	5	16	25	11	25
Non-veg (animal food)									
Milk (Lit)	100	21	37	22	0	66	72	49	39
Vegetables	100	0	12	72	70	0	44	111	108
Fruits	33								

**Table 62: Income balance in percentile groups (savings or debt Rs.)**

	10P	25P	50P	75P	90P
Reference	-170.000	-79.600	<b>-19.800*</b>	31.900	89.800
SSP	-136.000	-47.800	<b>16.800*</b>	72.100	140.000

UAV test: Sig 0.013

**Table 63: Average number of animals per farm**

	Reference		SSP	
	2010	2015	2010	2015
Dairy cows	0,4	0,48 <sup>a)ns</sup>	0,62	0,7 <sup>a)ns</sup>
Buffalos	0,62	0,59 <sup>b)ns</sup>	0,88	0,75 <sup>b)ns</sup>
Poultry	1,0	10,1305 <sup>c)ns</sup>	2,72	10,05 <sup>c)ns</sup>
Goats	0,38	0,51 <sup>d)ns</sup>	1,12	1,45 <sup>d)ns</sup>
Sheep	0	0,13	0	0

a) ns sig 0.07; b)ns sig 0.197; c) ns sig 0.983; c) ns sig 0.983; d) ns sig 0.087

**Table 64: Number of animals per farm 2010 and 2015**

	Category	5	10	25	50	75	90	95
Dairy cows - 2015	Reference	0	0	0	0	1	2	2
	SSP	0	0	0	0	1	2	2
Dairy cows - 2010	Reference	0	0	0	0	0	2	2
	SSP	0	0	0	0	1	2	2.1
Buffalos - 2015	Reference	0	0	0	0	1	2	2
	SSP	0	0	0	0	1	2	3.1
Buffalos - 2010	Reference	0	0	0	0	1	2	4
	SSP	0	0	0	0	1	2	4
Poultry - 2015	Reference	0	0	0	0	0	0	1.95
	SSP	0	0	0	0	0	0	10.5
Poultry - 2010	Reference	0	0	0	0	0	0	0
	SSP	0	0	0	0	0	0	0
Number of goats - 2015	Reference	0	0	0	0	0	1	3
	SSP	0	0	0	0	0	3	10
Number of goats - 2010	Reference	0	0	0	0	0	1	2.95
	SSP	0	0	0	0	0	2	7.3

**Table 65: Percentage of households with no (level 0) food self sufficiency**

Month	Sorghum		Wheat		Pulses		Vegetables	
	Reference	SSP	Reference	SSP	Reference	SSP	Reference	SSP
1	23.6	24.1	69.0	61.8	52.0	35.9	78.0	48.7
2	24.0	24.2	70.0	61.3	52.0	36.7	79.5	57.8
3	24.0	25.1	70.0	60.3	52.5	37.2	81.5	62.8
4	21.1	21.6	69.0	59.8	51.0	36.7	84.0	65.8
5	22.5	22.6	69.5	59.8	50.5	37.2	85.5	70.4
6	23.0	24.1	70.5	60.8	51.0	38.7	84.0	68.8
7	23.5	24.6	72.5	62.8	52.5	42.7	79.5	61.3
8	25.0	24.6	73.5	63.8	53.5	42.2	70.5	45.7
9	25.5	25.6	75.0	65.7	55.0	42.7	69.0	46.7
10	26.0	25.1	75.0	65.3	55.5	43.2	72.0	46.7
11	27.5	26.1	74.5	66.3	57.5	43.2	73.0	49.7
12	27.6	28.1	74.5	67.8	58.5	43.7	74.9	52.0
<b>Av.</b>	<b>24,4</b>	<b>24,7</b>	<b>72</b>	<b>63,0</b>	<b>53,5</b>	<b>40,0</b>	<b>77,6</b>	<b>56,4</b>

**Table 66: Means of production and consumption per household in kg and value ( Rs.)**

	Auto consumed	Purchased	Sales	Own production	Auto consumed	Purchased	Sales	Own production
	kg	kg	kg	%	Rs,	Rs,	Rs,	%
	<b>Sorghum</b>							
Ref,	209	71	47	75%	4,151	1,299	905	76%
SSP	231	94	45	71%	4,861	1,151	961	81%
	<b>Wheat</b>							
Ref,	44	186	2	19%	1,107	1,990	81	36%
SSP	67	158	4	30%	1,820	1,839	108	50%
	<b>Rice</b>							
Ref,	0	116	0	0%	0	1,112	0	0%
SSP	0	100	0	0%	0	735	0	0%
	<b>Pulses</b>							
Ref,	43	35	77	55%	1,733	3,039		36%
SSP	51	26	108	66%	2,608	2,483		51%
	<b>Vegetables</b>							
Ref,	23	-	351	-	587	5,151	5,410	10%
SSP	62	-	705	-	2,140	4,391	11,607	33%

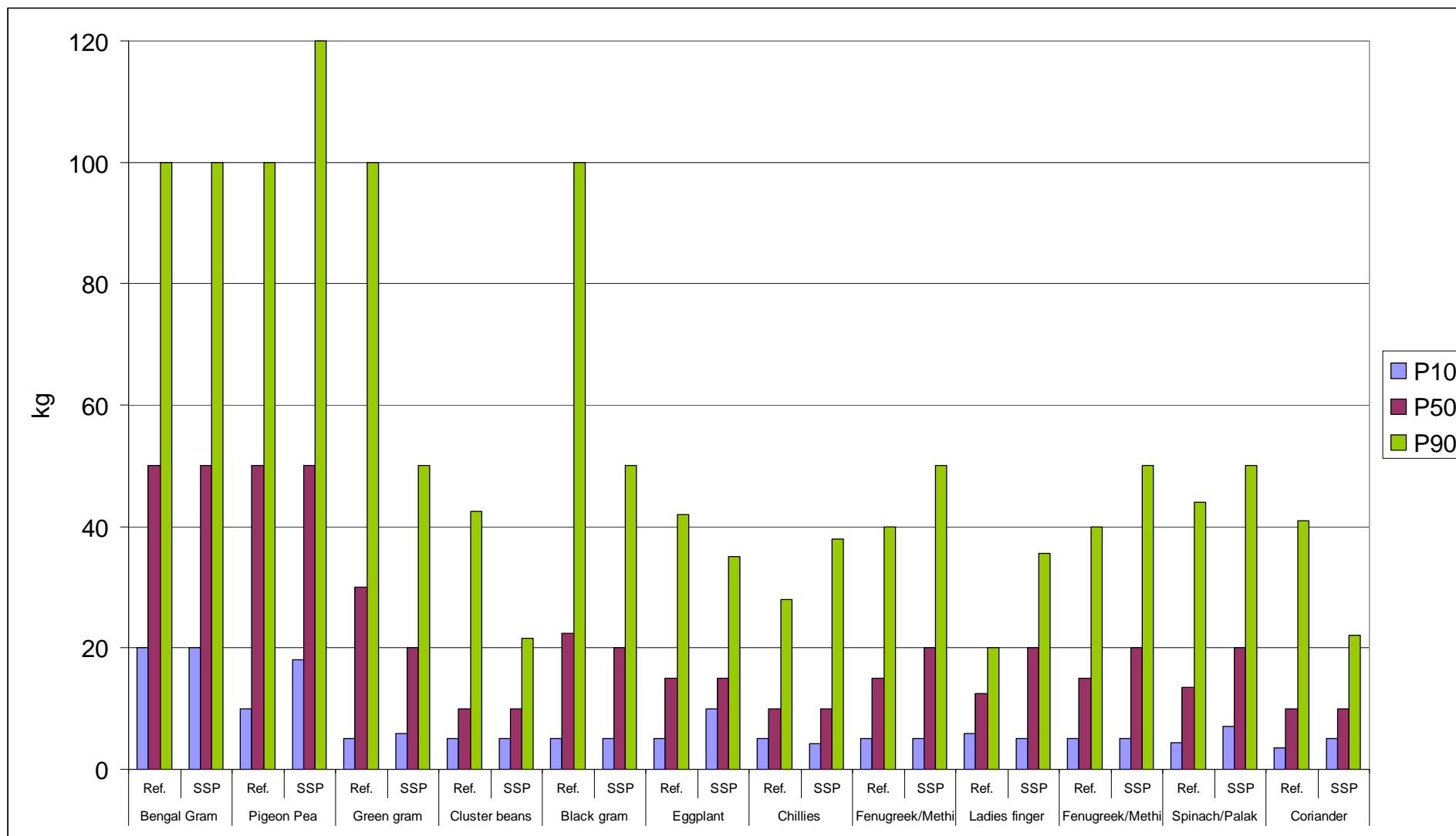
**Table 67: Dietary recommendations National Institute of nutrition India**

**Recommended Dietary Allowances for Indians  
(Macronutrients and Minerals)**

Group	Particulars	Body weight kg	Net Energy Kcal/d	Protein g/d	Visible Fat g/day	Calcium mg/d	Iron mg/d
Man	Sedentary work	60	2320	60	25	600	17
	Moderate work		2730		30		
	Heavy work		3490		40		
Woman	Sedentary work	55	1900	55	20	600	21
	Moderate work		2230		25		
	Heavy work		2850		30		
	Pregnant woman		+350	+23	30	1200	35
	Lactation 0-6 months		+600	+19	30	1200	21
	6-12 months		+520	+13	30		
Infants	0-6 months	5.4	92 Kcal/kg/d	1.16 g/kg/d	–	500	46 µg/kg/day
	6-12 months	8.4	80 Kcal/kg/d	1.69 g/kg/d	19		5
Children	1-3 years	12.9	1060	16.7	27	600	09
	4-6 years	18	1350	20.1	25		13
	7-9 years	25.1	1690	29.5	30		16
Boys	10-12 years	34.3	2190	39.9	35	800	21
Girls	10-12 years	35.0	2010	40.4	35	800	27
Boys	13-15 years	47.6	2750	54.3	45	800	32
Girls	13-15 years	46.6	2330	51.9	40	800	27
Boys	16-17 years	55.4	3020	61.5	50	800	28
Girls	16-17 years	52.1	2440	55.5	35	800	26

Source: National Institute of nutrition (2011): Dietary guidelines of Indians

**Figure 22: Home consumption of pulses and vegetables per household in percentile groups**



## Appendix 2: Household questionnaire

### Misereor: SSP Household Impact Survey 2016

ADMINISTRATION: general section												
1	Questionnaire number											
5.	Village/Zone	Tuljapur		Tuljapur		Osmanabad		Osmanabad				
		Nilegaon		Masla Khurd		Hinglajwadi		Bavi				
		Chiuri		Sindhphal		Keshegaon1		Mohtarwadi				
		Devshinga		Tirth		Ansurda						
		Gandhora		Salgra		Medsinga						
		Kemwadi		Andur		Kini						
		Keshegaon2		Katgaon		Ter						
7	Name of the enumerator		1.BS	2.SK	3.CA	4.AK	5.SB	6.KC	7.MM	8.SE	9.	10.
8	Category of farmer		Reference				SSP Adopter					
9	Name of the interviewee											
10	Age of interviewee											
11	Sex of respondent		Male				Female					
12	Marital status – (MC and tick)		1 Single		2 Married		3 Separated		4 widowed			
131	Does the interviewee hold a special in SSP? (MC and tick)		Trainer		Leader		Member		na			
14	No of household members children and adults (all people eating together) (number)		Age groups	0-5	6-10	11-14	15 – 24	25 – 64	>= 65	Total		
			M									
			F									
143	Membership of organisations (MC and tick)		1. None		2. SHG		3. Farmers Group					
			4. Gram Panchayat		5. Village Development Committee		6. Other specify					
EDUCATION												
13	Education level of interviewee (Tick highest level)		1. None		5. HSC (10+2)							
			2. Primary/ up to class 4		6. Diploma/ degree							
			3. Primary class 5 to 7		7. Post graduate							
			4. SSC (8-10th)									
16	How many children attend to school ? (Number)											
LAND MANAGEMENT												
										<b>Acres</b>		
18	Total land owned											
183	Total land used according to 1 acre model system											
19	Land bought in the last 5 years											
191	Land sold in the last 5 years											
21	Land borrowed for free from other farmers/relatives											
211	Land taken in lease from other farmers											
212	Land given on lease to other farmers											
24	Land used for fallowing (uncultivated for rest at least 1 year)											
241	Land under forest or woodlot or orchard (on bunds it counts 0)											
242	Total land cultivated (18+ 211-212)											



Land under cultivation in various seasons (2015)											
	Season	Dry / Rain fed only	Irrigated acres								
			Flood	Drip	Sprinkler						
251	Rabi (winter)										
252	Summer	XXXXXXXX									
253	Kharif										
LABOUR											
161	Family labour available	Husband									
		On farm hours		Own business		Migration outside job					
		Days per year									
		Wife									
		On farm hours		Household		Business or outside					
		Days per year									
		Other adults (number)		Use averages below for all persons							
		On farm hours		Household		Business or outside		Education			
		Days per year									
		Children 11-14 years									
On farm /household work hours		School		Little outside jobs							
Days per year											
162	Permanent labourers (Number)										
	Hired labour	Seasons				Gender	Daily rate	Person days	Amount		
		Season1: Rabi				M XX					
						F XX					
		Season 2: Summer				M XX					
						F XX					
		Season 3: Kharif				M XX					
						F XX					
		Estimate hired labour for livestock				M XX					
						F XX					
		<b>Average (Male)</b>				M XX		XXX	XXX		
		<b>Average (Female)</b>				F XX		XXX	XXX		
		<b>Total (Male)</b>				M XX	XXX				
<b>Total (Female)</b>				F XX	XXX						
Free exchange of labour					In		Out				
LIVESTOCK											
	Animals (including calves)			2015 (Number)	2010 (Number)						
26	No of ox and non dairy cows										
27	Dairy cows										
28	No of buffalo										
29	No of poultry										
30	No goats										
31	No of sheep										
ASSETS											
33	Is your house owned or rented?			Owned		Rented					
34	Quality of main housing? (Tick)	Walls/structure			341	Roof			342		
		Permanent (bricks)				Iron sheets (ACC)					

		Mud walls		Concrete (RCC))											
		Stones		Thatch											
		Wood, tin, other													
35	<b>Assets:</b> What of the following items do you own today?  <b>(Tick)</b>	<b>Items</b>	<b>Tick</b>	<b>Items</b>	<b>Tick</b>										
		Motor car		Tractor											
		Auto (tricycle)		Plough											
		Motor bike		Sprayer											
		Bicycle		Thresher											
		Solar products		Seed or fertilizer drill											
		Television		Stable for goats											
		Phone, mobile		Stable for Cows											
		Fridge		Poultry shed											
		Sewing machine		Farm storage structure											
		Second (farm) house		Bullock cart											
<b>FOOD SECURITY</b>															
361	Are you self sufficient (own farm) in the food categories mentioned? <b>Rate 0/1/2/3/4</b>	Month	1	2	3	4	5	6	7	8	9	10	11	12	
		Sorghum													
		Wheat													
		Pulses													
		Vegetables any 3-4 types													
362	What part of the above food do you produce yourself?	100 % own production <b>(tick)</b>													
		State what % you receive free from relatives or others <b>(percentage)</b>													
<b>HEALTH</b>															
38	Do you think you have a <b>healthier diet</b> today compared to 5 years ago? Do you eat more/same/less of any of the following food items?	<b>Category</b>	<b>Eat more</b>	<b>Eat the same</b>	<b>Eat less</b>	<b>n.a.</b>									
		Wheat													
		Rice													
		Millets (Jowar, Bajra)													
		Groundnuts													
		Pulses													
		Vegetables													
		Fruits													
		Eggs													
		Meat													
	Dairy products														
	Fish														
381	Do you use clean drinking water all year round? <b>(Rate 0/1/ 2/ 3/ 4)</b>	<b>Adults</b>													
		<b>Children</b>													
<b>EXTENSION services</b>															
42	How often do you get extension services of any organisation in your village?	<b>Frequency</b>	<b>SSP</b>	<b>Other NGOs</b>	<b>KVK, Agric Dep, and other</b>										
		Never													
		Once in 2 years													
		Once a year													
		Twice a year													
		Quarterly													
	Monthly/ more														
43	How do you rate the quality of the extension services you receive? <b>(usefulness, helpfulness)</b>	<b>Organisation</b>	<b>na</b>	<b>Fair</b>	<b>Medium</b>	<b>Good</b>	<b>Very good</b>	<b>Excellent</b>							
		SSP													
		Other NGOs													
		KVK, Agric Dep, other													

PRODUCTION												
		Q45					Q70	Q71	Q72		Q636	Q641a
		A	B	C	D	E	F	G	H	I	J	K
Q 45 Crops (Use R 1 acre = 40R)	P/ i/ -	Rabi	Summer	Kharif	Total Area	Total production	Own consumption	Marketed Surplus	Value/kg	Farm produced consumed (Value)	Farm produce Sold (Value)	
		R	R	R	R	Kg	Kg	Kg	Rs	RS	Rs	
					B+C+D	A	B	H= (F-G)		G*I	H*I	
<b>1. Cereals</b>												
a	Sorghum											
b	Pearl millet (Bajra)											
c	Wheat											
d	Rice											
e	Maize											
<b>2. Pulses</b>												
f	Pigeon Pea											
g	Bengal gram											
h	Green gram											
l	Black gram											
J	Moth bean (prouthed)											
k	Green peas											
<b>3. Cash crops</b>												
L	Soy bean											
n	Sugar cane											
p	Cotton											
<b>4. Vegetables</b>												
q	Bitter gourd											
r	Bottle gourd											
s	Cabbage											
t	Chillies											
u	Cluster bean											
v	Coriander											
w	Eggplant/Brinjal											
x	Fenugreek/Methi											
Y	Ladies Finger											
Z	Onion											

PRODUCTION												
		Q45					Q70	Q71	Q72		Q636	Q641a
		A	B	C	D	E	F	G	H	I	J	K
	Q 45 Crops (Use R 1 acre = 40R)	P/ i/ -	Rabi	Summer	Kharif	Total Area	Total production	Own consumption	Marketed Surplus	Value/kg	Farm produced consumed (Value)	Farm produce Sold (Value)
			R	R	R	R	Kg	Kg	Kg	Rs	RS	Rs
						B+C+D	A	B	H= (F-G)		G*I	H*I
aa	Tomato											
ab	Spinach/Palak											
ac	Grapes											
ad	Capsicum											
ae	Rajgira											
af	Sunflower											
ag	What other vegetables do you grow. (Consider list*)	#	XX	XX	XX	#	XXX	XXX	XXX	XXX	Yes	Yes
*Garlic, Dolichos lab lab, beetroot, Carrot, Chuka, Cucumber, Ginger, Pineapple, Radish, Potato, Sweet potato, Karla,												
5.	<b>Oil seeds and others</b>											
ar	Ground nut											
as	Lin seed											
at	Safflower											
au	Sesame											
av	Mustard											
aw	Poppy											
ax	Floriculture											
<b>Total</b>												
											<b>Q636</b>	<b>Q641a</b>

460	What is the total area of pasture or fodder ( <b>Guntas</b> )				
461	How many different grasses or legumes do you grow? ( <b>Number</b> )				
451	What number of <b>fruit trees</b> do you have?	<b>Crop</b>	<b>Numbers</b>	<b>Crop</b>	<b>Numbers</b>
		Banana		Castor	
		Custard apple		Coconut	
		Grapes		Indian gooseberry/Amla)	
		Guava		Moringa/drum stick	
		Jack fruit		Other specify	
		Lemons		Pomegranate	
		Mango		Tamarind	
		Oranges		Svzygium cumini/Jamun	
		Papaya		Ziziphus/ber	
	Other specify				
461	How many different <b>tree species</b> do you have on your farm? ( <b>Number</b> )				

CROP YIELDS						
661	Consider there are new agricultural techniques being promoted in the last 5-10 years. Did you adopt any of these and do you think that due to that you managed to increase the yields of any crops you grow. Estimate the % of yields increase/decrease					
	<b>Drop of 0-25% or more</b>	<b>+5% the same</b>	<b>Up to 20%</b>	<b>Up to 40%</b>	<b>Up to 60%</b>	<b>More than 60%</b>
662	Specify crop(s) that benefitted from increases					

Next section only for SSP only					
551	What acentage of your total land would fully comply to the recommendations given for the 1 acre model			<b>2012</b>	
				<b>2013</b>	
				<b>2015</b>	
51	In what of the following <b>SAP practices</b> were you trained and which do you apply currently /permanently?	<b>Practices</b>		<b>Trained (Y/N)</b>	<b>Adoption (0/1/2/3/4)</b>
		Soil testing			
		Seed inoculation			
		Germination testing			
		Utilisation of own seeds			
		Cultivation of vegetables			
		Cultivation of food crops			
		Intercropping/Mixed cropping			
		Cultivation of fodder ( <b>on farm</b> )			
		Cultivation of fodder ( <b>Hydroponics</b> )			
		Cultivation of Azolla			
		Organic manures* ( <b>Biodynamic compost and Vermi compost</b> )			
	Organic solutions for pest control ( <b>Neem bark and Dashpharni</b> )				
	Farm bunding ( <b>entire farm</b> )				
551	Did you receive training on hygiene and food practices and what did you adopt?	<b>Type</b>		<b>Trained (Y/N)</b>	<b>Adoption (0/1/2/3/4)</b>
		Hygiene			
		Sanitation			
		Recipes on local available foods			

57	Do you, as women feel more socially empowered through the training process? <b>(MC and tick)</b> <i>Directly address the woman</i>	You have a personal bank account	
		Marketing the produce individually	
		Full decision making for the land allocated to the one acre model	
		You contribute more income towards the household	
		You improved the health situation of family members	
		You feel more respected within your local community	
		You can act more self-confident in family and community	
		Your adolescent girls of the family are getting enough nutrition	
		You have taken Haemoglobin tests repeatedly and results are improving	
		You consult health services regularly whenever needed	
571	Did you receive any training to improve working in groups? <b>(MC and tick)</b>	Group leadership	
		Proper bookkeeping	
		Managing savings	
		Managing credits	
553	What types of stoves are you using <b>(MC and tick)</b>	Chula	
		Smokeless Chula	
		Kerosene stove	
		Electric stove	
		Biogas	
		LPG stove	
		Solar cooker	
		Pellet biomass stove	

This section for all again

Farming problems / solutions		
601	What are your current most pressing agricultural problems?  <b>Ask farmer without prompting Top three; tick list if appropriate</b>	1
		2
		3
602	What new activities could be taken up by SSP to help you in the future to solve problems	1
		2
		3

FARMING PRACTICES and FARMING COSTS						
47	What are the quantities of chemical fertilizers used?  <b>Specify quantity used per year (all seasons combined)</b>  <b>Copy quantity to expenditure Q631</b>	<b>Fertilizer</b>	<b>Kg</b>	<b>Unit price</b>	<b>Value</b>	
		If yes, specify quantity				
		Liquid fertilizer				
		N/P/K				
		Single super Phosphate.				
		DAP				
		Urea (46/0/0)				
49	How did you <b>control weeds?</b> <b>(Tick)</b>	Hand weeding	T	XX	XX	
		Mulching	T	Xx	XX	
		Chemical herbicide	T	XX		
632	<b>Farm production costs</b>  <b>*** Consider putting just annual cost not full amount</b>	Seeds, planting materials	XX	XX		
		Livestock costs, feeds, vaccines, medicines	XX	XX		
		Land rental; shared payments in kind	XX	XX		
		Hired labour or permanent labour <b>Copy</b> from first page	XX	XX		
		Farm electricity bill	XX	XX		
		Irrigation water	XX	XX		
		Oil, fuel, gasoline	XX	XX		
		Maintenance machinery, repairs	XX	XX		
		Crop or livestock loans	XX	XX		
		Rent machinery, threshing	Xx	Xx		
		Loan repayments for tools or equipment plus interest	XX	XX		
		1***Purchase of any expensive items. Total annual amount repaid	XX	XX		
		***Buying land - Total annual amount repaid	XX	XX		
Any other farm expenses	XX	XX				
471	What is the quantity of organic manures used in the farm?	<b>Manure</b>	<b>T / kg</b>		<b>Own</b>	<b>Purchased</b>
		Animal manure	T	XX		
		Compost / Bio dynamic compost	T	XX		
		Vermi compost	T	XX		
		Mulch	T	XX		
<b>Total (Copy total for "own" to subsistence food)</b>						
48	How did you <b>control pests?</b> <b>(Tick)</b>	Organic pesticides	T	XX		
		Inter cropping system	T	XX		XX
		Crop rotation	T	XX		
		Trap crops	T	XX		
		Any traps	T	XX		
		Chemical pesticide	T	XX		
632		<b>Total farm production costs (632)</b> <b>Copy to next page</b>				
632a		1*** type of investments specify in words				

EXPENDITURE: Household spending (1-12 -2015)						
631	What food items and other necessities did you buy?  Estimate month (12) Or weeks (52)	<b>Category</b>	<b>Kg</b>	<b>Price/kg</b>	<b>Value annual</b>	
		Wheat				
		Rice				
		Millets Jowar				
		Pearl millet, Bajra				
		Pulses				
		Groundnuts				
		Milk				
		Vegetables	XX	XX		
		Buy meat or fish and eggs	XX	XX		
		Salt, sugar, cooking oil, soap	Xx	XX		
		Kerosene, electricity	XX	Xx		
		Transport (bus, taxi, any means)	XX	XX		
		Taxes	XX	XX		
		Insurances	XX	XX		
		All water related costs	XX	Xx		
		Housing (rent, upgrades)	XX	XX		
		Contributions to celebrations, funerals	XX	XX		
		Education and related costs	XX	XX		
		Clothing	XX	XX		
		Health care, medicines, hospital	XX	XX		
		Consumption items: radio, TV, beauty, etc	XX	XX		
		Mobile bill	XX	XX		
		Drinks, leisure	XX	XX		
		*** Major functions (marriage, etc.) (Annual total repayment)				
		Loan repayment for household expenditures	XX	XX		
Other						
		<b>Household expenditure (Q631)</b>				
		<b>Food and consumption</b>				
680	Expenses for other non agric businesses	Materials, inputs, etc	XX	XX		
		Hired labour, anything	XX	Xx		
		***Purchase of any expensive items (annual total repayment)	<b>Specify type:</b>			
		Other e.g. loan	XX	XX		
		<b>Total costs other business 680</b>				
<b>632</b>	<b>COPY</b>	<b>Total farm production costs (632)</b>				
<b>633</b>		<b>Grand total household expenditure (Q631 + Q632+680)</b>				
633a		Calc spending per day (divide Q633 by 365)				



INCOME: Subsistence value - farm produce consumed (Jan to December 2015)					
636	How much of your own farm product do you take for <b>family consumption</b> ?  <b>Conversion factors:</b> <b>Weekly = 52 weeks a year</b>	<b>Category</b>	<b>Unit measure (Kg per unit)</b>	<b>Price per unit</b>	<b>Value</b>
		Milk consumed			
		Fruits (Papaya, mango etc.)	XX	XX	
		Poultry, meat or eggs, fish, goat	XX	XX	
		Feeds for livestock (value root crops, no green fodder)	XX	XX	
		Value own Seeds not purchased	XX	XX	
		Organic own fertilizer Copy Q471	XX	XX	
		Own pesticides Copy Q	XX	XX	
		Copy value Crops from Q636 (p5)	XX	XX	
		Other			
		<b>Total value home consumption (Q636)</b>			

CASH INCOME estimate (Jan to December 2015)					
640	<b>Other income sources (Off-farm)</b>	Small business <sup>1</sup>			
		Remittances			
		Employment (net) Or pension income			
		Casual labour			
		Others, specify			
		<b>Calculate total off-farm income (Q640)</b>			
641	<b>Farm income</b>	<i>Farming crops</i>	<i>Quantity</i>	<i>Unit price</i>	<i>Annual value</i>
	<b>Regular sources</b>	Milk sold			
	Crop income	<b>Copy from Q641a</b>	XX	XX	
	Any animal sales				
	Poultry and eggs				
	Fishing				
	<b>Juices</b> processed or packed foods				
	<b>Other products</b> (e.g, timber,				
	<b>Calculate total farm cash income (Q641)</b>				
	642	<b>Total cash income per year off-farm and farm (Q640+Q641)</b>			
643	<b>Total income per day</b> Divide above (Q642) by 300				
	1) Specify type of business man Tick		Shop		
			Driver		
			Craftsman		
			Tailor		
			Repair/Service		
			Other specify		
		Specify			
1) Specify type of business woman		Specify:			

**Do this section last! Compare Expenditure and cash income and calculate balance**

645	<b>Balance total income (Q642) less expenditure (Q633)</b>	Recalculate in case of big deviations!
-----	--	--

Explanation of balance above.

- Is above balance correct or may be income or expenditure are wrongly estimated?
- Try to correct estimates if the Balance is negative and greater than 30% of income

635	Balance utilisation <b>(MC and Tick)</b>	<b>Option</b>			Tick	Amount
		Utilisation of old savings to buy major farm assets or functions, or health costs				
		Profit was reinvested or saved				XXX
		Last years loss was covered by existing savings				XXX
		Last years loss was covered by new loans and increased debt of family				XXX
638	What types of loans have you going <b>(MC and tick)</b>	I have no loans		Family or relative		
		Bank		Money lender		
		Self-help group		Micro Finance Institution		
		SSP Federation		Farmer group loan		
639	What is the trend of loans over the last 10 years <b>(MC and tick)</b>	Never any debt problems		Debts are the same		
		I manage to decrease the volume of debts		The debt problems are getting worse		
	How do you estimate that your income has changed compared to the year 2010?	<b>Decrease</b>	<b>The same</b>	<b>Better</b>	<b>Much better</b>	
646	Farm income					
647	Off-farm income					
648	Do you see a difference in the quality of your life in the last five years?	<b>Decrease</b>	<b>The same</b>	<b>Better</b>	<b>Much better</b>	
649	Record values of soil laboratory analysis	<b>Carbon %</b>	<b>N</b>	<b>P</b>	<b>K</b>	

75	<i>Phone number of interviewee</i>			
650	Internal use: Sections were data is may be biased or understated <b>(MC and Tick)</b>	Income Farm		Cost farm
		Income Off- farm		Cost off farm
		Expenditure household		Other specify

70	Comments, observations After interview if any	Enter this after the interview
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**Thank you so much for the interview!**

### Appendix 3: In-depths qualitative interviews

The interview with the Craikwail family is a very good example for SSP farmers. The family moved to Mumbai in the early seventies and worked in the textile industry. Only 5 years ago they returned to their original village and started farming. They learned about SSP practices and adopted these with outstanding success. In order to better understand the interview, it is important to add some of the atmosphere of the interview. All family members were present, the wife was doing most of the answering, but the husband and two daughters-in-law were also sharing their views. Thus, there was very lively talking, much laughing and it could be seen easily that all family members were very happy and excited to talk about their life. They presented their farming achievements very proudly with shining eyes. Needless to say, that the research team felt that all these observations are very good indicators for strong positive change. The family example helps to get an authentic insight into the lives of people.

The interview is presented below:

Mahanaula Craikwail, 50 years old (wife)  
Shahuraj Craikwail, 69 years old (husband)

*What is your educational status?*

We are both illiterate.

*Please tell us something about your family history?*

After marriage our family moved to Mumbai in the early 1970ties. I (wife) worked there in textile industry. My husband also found a job in the textile industry as an operator. In 1998 health problems started. We felt more and more uncomfortable in Mumbai. In 2010 my husband suffered an electrical accident at work. He was very ill for a long time. So we decided to move back to his birth village Salgara here in Osmanabad District.

*How do you compare Mumbai with your village here?*

The area in Mumbai is more developed and there are more services available also like schools. But I think here there life is much better still (All family members share in by nodding and short statements). With the help of our savings we managed to buy 6.5 acres of land here in the village and we all returned in 2011.

*What are the livelihood activities you have taken up?*

We are all doing farming. My husband is retired and also working on the farm. My oldest son is an army officer. For 8 months in a year he is away. Our second son works as a driver and he lives here in our household with us. His wife is also helping with farming and earns some money with part-time tailoring.

*Tell us more about your children and their educational status?*

My eldest son, he is army officer, he is married, his wife is 27 years old, and she lives with us here in the house. She has 3 young children that are now in between and 2-5 years old.

Our second son, the lorry driver, he is married too and his wife is 21 years and she also lives with us here in the house. She is now pregnant with first child. We have adopted another son who is 18 years old. He is the son of my husband's brother who died. So now he lives with us.

*When did you start farming here?*



Family Craikwail from Salgara village

In 2011 we started to grow some pulses and soya in the conventional way. In 2012 we heard about the work of SSP and started to attend some trainings. In 2013 we began to operate the 1 acre model. We started little by little.

*Please tell us a little more about your farm*

We cultivate all the land we bought that is 6.5 acres. We have some land that can be irrigated. 1 acre is flood irrigation by borewell. Due to the drought the bore well could not be used for irrigation in the last 2 years. But we had to reserve it for drinking water purposes only.

*Do you own any livestock?*

At first we didn't have any. In 2014 we bought a young calf of a milking cow. We also have 4 layer hens to give us some eggs. We now plan also to buy another calf.

*How much area do you cultivate according to the one acre model today?*

In 2013 we still used some chemical fertilizer (DHP). Since 2014 we stopped that and we have become fully organic on the whole farm. We also do not use any chemical sprays anymore. Everything is fully organic. At the beginning it was quite difficult. It takes considerable time to prepare the organic sprays. It takes some 2-3 weeks prior to each season to get all the materials organised. It needs to be ready beforehand. At first, I had to look around and search for the right leaves for a long time. Now, it is much easier as all is well set-up and I know where to find the right ingredients.

Earlier we spent much money on health costs. Now with the new food everybody is healthy and health costs are down. Earlier we had 10 lakh health costs and buying vegetables was expensive.

*What are your reasons for taking up one acre model?*

Earning some money. Having the better food. They saw many advertisements on TV that chemical fertilizer is not dangerous. They also saw on TV that medicines should be harmless. But they felt health problems and didn't believe that. The SSP staff that worked with them convinced them very much that another approach is better.

Now the children are very healthy and strong. We have no more spending on health costs.

*How easy or difficult was the process of adopting one acre model?*

The chemical way is very easy. You just buy what you need and you can start. The organic way is more difficult at the beginning. You need to work harder and you need to prepare things timely. For example for preparing organic sprays to need to find the right leaves. These are difficult to find.

*Do men and women work their own part of land?*

No, they work all land jointly. Working together is easier compared to alone.

*Household decision making -who is deciding what?*

We all take decisions together (They are all laughing). There are three generations in the house. All discuss what needs to be done and then they decide together what is the best way to do things. I (Daughter-in-law) even consult my husband who is far away on phone to make a decision what to do. We talk about everything and see what are the chances and risks. Then we agree what to do jointly.

*So you do all the needed work together?*

Yes, we even developed a hand weeder that can be pulled by two persons. That helps to make the weeding much easier and faster. (They show a few photos of the weeding process on their mobile phone).

*Have gender relations improved due to SSP work?*

The relations between all our family members have always been good. We like each other. We also have a bank account as part of the agricultural group. It does not belong to the self-help group. We put some money into the bank account regularly.

*Do you share your household resources?*

Yes, we share our resources. We live in a tin house that has 4 rooms. All together there are about 100m<sup>2</sup> space. In Mumbai we first had only one single room that was only 15m<sup>2</sup>. Later when the children grew up we had 2 little rooms. There never was space to have friends or to organize festivities. Now we are much better off. There is space in the house and in the village they enjoy many festivities with the other villagers.

*Who generates the off-farm income? What role does the off-farm income play for total household income?*

Our two sons that have employment jobs are saving money regularly and send money home. We also earn some money with the tailoring work of my daughter-in-law. We plan to buy a buffalo next. The buffalo can help with the field work.

*How is that you could adopt the model so well and are far ahead than other people in the village? What are the contributing factors?*

We focus our attention on the food for the household first. That has always priority. Out of the 6.5 acres we only grow 2 acres of soya for cash income. The green gram we cultivate is a new crop we started recently. We now planted trees too: Mango and drum stick on the farm bunds. We also planted custard apple as a trap crop for pests. A special role for food plays the yellow and white sorghum we plant. The white sorghum is for the winter rains and the yellow sorghum for the monsoon rains. The yellow one is very good for health and it is a very old traditional variety. However, in 2015 due to the drought the food on the farm was not enough. We had to buy some sorghum from the market. In the other years we always have enough from the farm and we can sell some produce. Also some of the pulses and the vegetables failed in 2015 due to the drought. In Rabi (winter) and Kharif (summer) we couldn't do any vegetables as there wasn't enough water. In other years we have enough of that too.

SSP helped us so much to link up to agricultural information. We now also call up the Government Call centre for agricultural advice. Sometime we even call-up help numbers that are displayed on TV to get advice. And we are linked to some SMS services that give us up to date agricultural information. All that helps us so much.

They rely too much on hired labour. Hired labour don't work well.

*What are the crops you do organically?*

Wheat, sorghum, linseed, millet, soya, green gram, red gram, black gram, bengal gram and some leafy vegetables. We do all fully organic.

*What are crops you still do conventional (if any)?*

None

*What are the inputs you use in one acre model?*

Just organic inputs, farmyard manure, organic sprays to boost the plants, urine sprays.

*What are the inputs you use on the rest of the farm - do you distinguish the two?*

No it is all one farm. Nothing is conventional.

*Did you ever use pesticides on your one acre model farm? If yes, under what circumstances?*

Before we sometimes used pesticides. Now that is completely stopped.

*Have gender relations improved due to SSP work?*

The relations between all our family members have always been good. We like each other. We also have a bank account as part of the agricultural group. It does not belong to the self-help group. We put some money into the bank account regularly.

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*Why are other women farmers not able to adapt to the model? Do you know their difficulties?*

They rely too much on hired labour. Hired labour don't work well.

*What are the crops you do organically?*

Wheat, sorghum, linseed, millet, soya, green gram, red gram, black gram, bengal gram and some leafy vegetables. We do all fully organic.

*Why are other women farmers not able to adapt to the model? Do you know their difficulties?*

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*What are crops you still do conventional (if any)?*

None

*What are the inputs you use in one acre model?*

Just organic inputs, farmyard manure, organic sprays to boost the plants, urine sprays.

*What are the inputs you use on the rest of the farm - do you distinguish the two?*

No it is all one farm. Nothing is conventional.

*Did you ever use pesticides on your one acre model farm? If yes, under what circumstances?*

Before we sometimes used pesticides. Now that is completely stopped.

*What effect had the drought of 2015 on your crop yields?*

In good rains in 2013 the yield of sorghum was 200 kg per acre. In the drought year in 2015 it was too dry to even attempt to cultivate sorghum. In 2013 we got 100 kg of red gram per acre and in the drought 2015 it was only 13 kg. So 2015 was a very bad year for us.

*You all look very happy and self-confident. However, is there anything you still fear?*

Yes, we fear that another drought like in 2015 could come. No other problems are there.

*Is there anything you hope for?*

Yes. We have plenty of plans. We want to improve on our farm. Next we want to put in place more water conservation measures so that we can harvest more rainwater.

*Thank you for the interview.*

Two more qualitative case studies are presented in the next section:

<b>Name</b>	<b>Vanitha Manshetty</b>	<b>Kavita Satyanarayan Hajgude</b>
<b>Village</b>	Chiwri	Kini
<b>Adoption stage</b>	Good adopter	Partial adopter
<b>Spouse name</b>	Balbhim Manshetty	Satyanarayan Hajgude
<b>Livelihood options taken up</b>	1) Agriculture 2)Diary farming 3) Civil contracts	Agriculture, son works with SSP as supervisor, diary, sets up stall in weekly market, husband works as gardener in agricultural college
<b>Educational background</b>	Studied till 8th standard	Fourth standard
<b>Children and educational status</b>	She has four girl children studying Bsc, 12th standard, 10th standard and seventh standard	Two children - one completed agricultural diploma (boy) and other is doing BSc (girl)
<b>When have you started working in one-acre model?</b>	2014	2011
<b>Cultivated area</b>	4 acres under one acre model	1.5 acres since beginning
<b>Irrigated area and type</b>	Family owns three acres of land and two more acres have been taken on lease. All the five acres of land is irrigated	1.5 acres since beginning
<b>Livestock</b>	One buffalo	Two buffalos
<b>Area under one acre model in 2015</b>	She started with an acre of land in 2014 and continued to do so till 2015. From 2016 onwards, she took up the model in 3 acres of land. Grapes and Soybean were taken up in one acre each under chemical based farming.	Chemical free food
<b>Reasons for taking up one acre model:</b>	SSP had taken her along with other members of producer groups to siddhagiri math for an exposure visit. During the visit she witnessed an acre of farm with hundred crops and has been inspired to take up such farming. Also, she felt that they are unaware of the inputs that are used by other growers on vegetables and other food grains that are available in the market. By then her husband had developed high blood pressure and diabetes because of which she was even more concerned about the health of her family and hence took up farming for the first time in her life. She took up organic farming to provide healthy food for her family members and not for selling in the market. But now she feels that she has been cultivating grapes using chemicals and has been selling the same in the market. She would like to go for organic cultivation of grapes and sell healthy grapes as well. She now feels that by taking up one acre model, she has been doing what the doctor has been doing for people -	Everyone on the house is involved in decision making

	providing good health	
<b>Household decision making, Who is deciding what?</b>	Both husband and wife are involved in making decisions and her husband discusses with her before taking any decision related to home or farm. Also, in certain cases the couple discusses important aspects with their daughters as well before taking decisions.	No. Our entire farm is under one acre model
<b>Do men and women work their own part of land?</b>	No. They work together jointly on the entire land	Yes
<b>Do they work together?</b>	Yes	Yes
<b>Are all resources shared or how is it organized?</b>	Shared	Gender relations were always good
<b>Have gender relations improved due to SSP work?</b>	Even before joining SSP, her husband would consult her in taking decisions. However, as she did not know anything about farming, she was not confident to give proper suggestions. However, after becoming part of the producer groups, her confidence improved. She is now able to take care of the farm on her own thereby providing free time for her husband to expand his civil contracting business. Owing to the same household income has also increased.	Husband and son. 50% of annual income comes from off farm
<b>Who generates the off-farm income? What role does the off-farm income play for total household income?</b>	Her husband generates off farm income through civil contracting such as laying roads, constructing water-harvesting structures etc. According to Vanitha around 50% of annual income comes from civil contracting and rest comes from agriculture and dairy activities. She feels that production from grapes amount to more than 35% of the annual income. Only 10% to 15% of income comes from cultivation of Soy bean and other crops taken up under one acre model.	Son works for SSP and hence she gets support from him
<b>What kind of support that you received from your family members?</b>	Her husband supports her in all farm related activities. Even children work in farm and help her in cultivation. Here children are proud of the activities she takes up as an organic farmer.	My son is working with SSP and he has been my greatest support
<b>How is that you could adopt the model so well and are far ahead than other people in the village? What are the contributing factors?</b>	I understood the importance of healthy food owing to ill health of my husband. I have also received support from my family in this regard.	Not sure



<b>Why are other women farmers not able to adapt to the model? What are their difficulties?</b>	Taking up a single crop such as Soybean provides one time cash income and one acre is meant for nutritional security and provides money from time to time. People are after money and are not able to understand the importance of this model.	We had vermi compost unit at our home. But because of worms coming out of the tub, we moved it to the farm. We use chemicals in Soy bean. We go for Chloropyriphos which is less toxic
<b>Probe difficulties (few crops, low livestock, continued chemical input use)</b>	In one acre model, many seeds are to be sown and hence seeds need to be changed in seed and fertilizer application separately. Hired laborers are in a hurry to finish work and move to the next farm and hence they are reluctant to change the seeds and fertilizers so many times.	Annasuraksha model
<b>What do you think SSP should do differently in order to ensure that others take up organic farming?</b>	SSP should train people on accounting their household expenditure. Only then will they understand as to how much money is being spent on buying food for home and also on hospitalization. Otherwise, people are under the impression that they are gaining a lot by taking one cash crop.	Chillies, Turmeric, Ginger, Brinjal, Tomato, Cluster beans, leafy vegetables, okra, red gram, soy bean, Black gram
<b>Is the "one acre model" a good name for that? Why not "start small, make good practices big"?</b>	Sakhi Kutumb suraksha model (Sakhi family security model)	Soy bean (we spray choropyriphos when required)
<b>What are the crops you do organically?</b>	Black gram, Green gram, Corn, Sesame, chilly, Soy bean, Sun flower, leafy vegetables, Brinjal Tomato, Castor	Rhizobium, vermicompost, vermiwash, Farm yard manure, organic sprays
<b>What are the crops you still do in a conventional manner (if any)?</b>	On Soybean we do not use any fertilizers, but insecticides are used. We grow grapes using chemicals - fertilizers, pesticides, weedicides etc.	At times we spray choloropyriphos
<b>What are the inputs you use in one-acre model?</b>	Farm Yard Manure, Cow urine, Vermicompost, Neem based solutions and other organic solutions	Yes. Cholopyriphos. When there are more pests
<b>What are the inputs you use on the rest of the farm (do you distinguish the two)?</b>	Yes. They are different. We use several chemicals for grapes	Nil
<b>Did you ever use pesticides on your one-acre model farm? If yes, under what circumstances?</b>	We take up Soy bean along with other crops in one acre model and we spray pesticides on Soy bean	12Q Soya, 70-80 tons of Sugarcane was obtained earlier.
<b>What are the other costs incurred on the model.</b>	They use manure from their dairy farm and make solutions out of locally available material. Hence there are no other costs. At times she buys few vegetable seeds and nothing else.	No. She goes to the weekly market to sell vegetables
<b>What is the yield per crop?</b>	Soy bean - 0.5quintal per Gunta, Corn - 25Kg per gunta, Red gram- 6Kg per gunta, Black gram - 16Kg/Gunta, Green	50%

	gram- 15Kg/Gunta. For vegetables she earned Rs.2000 and she is not clear about the quantity produced. They had actually maintained a piggy bank and saved all the money earned by selling vegetables and that amounts to Rs.2000 after deducting household consumption	
<b><i>Did you change anything in your marketing activities in the household?</i></b>	We used to sell at Solapur earlier and now we even go to Latur and Barshi to sell the produce	Yes.
<b><i>What percentage of food consumed do you cultivate yourself and how much do you buy?</i></b>	70% to 80% of food comes from farm	I was very happy two years ago when we took up vegetables as intercrop in Sugar cane. We reaped bumper harvest.
<b><i>Is it interesting to be fully self-sufficient?</i></b>	It is interesting to look at whatever I have produced on a daily basis. It is encouraging to look at new leaves emerging, new buds sprouting and fruits of my endeavors	Further drought
<b><i>What do you see as your biggest success?</i></b>	I cook whatever I grow. My husband appreciated me and said that even he could not reap such crops year after year	I would like to go for plantation of fruit trees
<b><i>Is there anything you fear,</i></b>	I fear about further droughts	
<b><i>Is there anything you hope for?</i></b>	I hope to see my children educated and settled	

## Appendix 4: Summarized case-studies of farmers

### Interview 01. Partial adopter

**Mrs. Parvali Shivaju Ganli. Salgra, Tuljapur.**

**Size of the holding:** 2.5 acres

**Observation:** The information contained in the questionnaire was not compatible with the reality. The total area of the farm was wrong and also the age of the informant.

**Reason for adopting the model:** In her perception, the one-acre model helps her family to have a better diet as they are consuming more vegetables. In addition, they don't use pesticides, and therefore the food is organic. The capacity building activities promoted by SSP was very important to adopt the production system.

**General features:** She and her husband cultivate a number of crops for both cash and home consumption. The main cash crop is soybean, and within the area devoted to the one-acre they are growing chili, groundnut, onion, maize, red gram, eggplant, sesame, spinach, and fennel among others. For fertilizing the field they use buffalo manure, as they have two animals. Spraying organic compounds such as neem extract makes crop protection. In addition they adopt other practices recommended by SSP such as soil testing, seed inoculation, and use of organic matter as mentioned.

**Nutritional and empowerment aspects:** She believes that their health improved substantially as they are spending less money with medicines and also she is feeling healthier. Today their family has more options to eat and their diet improved substantially. Decision-making is shared and they discuss what they will cultivate in the farm. One illustrative example of her empowerment just happened when her husband asked her to cultivate the whole area with soybean because of the good prices in the market, but she didn't agree and insisted to carry on with the one-acre model. Capacity building activities mainly promoted by SSP were critical to improve their living.

**Other comments:** The drought affected substantially their farm production, and she estimates that 75% of the food they had to buy in the market. She still has to sell her labour – 10 days per month on average –, and she wishes to implement a drip irrigation system to enhance production but at the moment they cannot afford it.

### Interview 03. Partial -adopter

**Mrs. Mudrika Mahadeo Hadgude**

**Size of the holding:** 0.75 acres

**General comments:** last year she was not using any technology because lack of information and she didn't know the cost to implement some of the technologies. The last season, because of the rain she just cultivates sorghum and wheat.

**One-acre model:** during the kharif season they are cultivating soybean, red gram, green gram, black gram, chili, vegetables, potato, and castor bean on the bunds. Last year she was not using any technology because she didn't have information about the system. This year she is using manure, adopting soil testing and seed inoculation. She had to sell the animal because of the drought and shortage of fodder. She is planning to buy another animal after harvesting, in November. They don't have irrigation and she and her husband provide the labour. They are happy with the work because they don't need anymore to buy vegetables from the market, and can save money. Their brothers in law insisted to not adopt the model, but she insisted and responded that the land belongs to her and she decides what to do. She would like to have a loan to improve the farm by implementing an irrigation scheme.

## **Interview 02. Good adopter**

**Mrs. Vijayabaj Shivbosappa Jalkote.**

**Size of the holding:** 2.5 acres and 1.0 acre model.

**One-acre model:** the benefits pointed by the farmer are related with producing their own food and therefore improving their diets and also representing an extra source of income. They saved money as they are buying less food in the market. All family members work in the area and also in the cash crops plantations: soybean, sugarcane, and green gram. They have 12 animals and in the one-acre area they just use compost, and the system is totally organic. She produces most seeds and she also participates in seed exchange schemes with other group members and neighbours. At the beginning her husband was not very confident about the results, but now he is very supportive. She got training from SSP in several cultivating technologies such as seed inoculation, soil testing and organic cultivation. She is adopting several technologies promoted. Some of the practices were also spread for the cash crops, and her husband is cultivating organically. When asked if her life and her family life has improved she had no doubt to state emphatically that their lives improved substantially as they are more healthier as the consumption of fresh products increased, the consumption of purchased products reduced, and reduced expenses with medicines. For the next year she will help 22 to 25 new members to adopt the model.

## **Interview 05. Adopter (good case for the resilience)**

**Mrs. Nanda Garad, Ansurela Village, Osmanabad**

**Size of the holding:** 1.02a

**General comments:** they have been working as rural labourers in other region and just recently came to Osmanabad. They bought the land with the help from their sons who work in Pune and Dubai. She is a rural leader.

**One-acre model:** the entire area of the farm of 1.02 acres is devoted to the model. They farm is totally organic and they use manure from one animal (buffalo) that they have. Among many crops they cultivate soybean, sesame, red gram, black gram, maize, vegetable (eggplant, okra, tomato, spinach, fennel, chili, cucumber and several leafs), and castor bean on the bunds. In one acre they have the cash crop, soybean, and the rest of the area, 0.03 acres they cultivate the vegetables. They are adopting several technologies such as soil testing, seed inoculation, and organic amendments (manure). She also rear hens to sell the eggs and the manure. The birds are fed partially with foodstuff distributed through governmental programs (wheat), sorghum, maize and vegetables. She also produces noodles during the summer to sell. Her plans are: 1. Irrigation scheme to improve production; 2. Enhance vegetable production; 3. Fruit trees; and 4. Medicinal plants.

## **Interview 02. Group discussion – adopters and non-adopters**

Participants: 1. Laxmi Daftaprya Birajdao, 2. Kanchan Prakesh Manshetty, 3. Amarya Satane, 4. Suman Subhash Suryavanshi, 5. Sindubui Shaburaj Ingale, 6. Shantabui Narsiny Zingre, 7. Mandabai Keemad Zingre. **Salgra, Tuljapur.**

**Seed conservation:** the adopters mentioned that they save money in conserving seeds, as they don't need to buy it in the market. They have some strategies to exchange seeds among the neighbours, group members and also with relatives. Some of the seeds they acquired through governmental programs and also bought in local markets. Most of the seeds are grams, sorghum, sesame and millet.

**One-acre model:** some of the advantages and reasons for adopting the one-acre model are related with production of fresh and organic food, and therefore improving the intake of healthy food. Others members mentioned the possibility of increasing income through selling the surplus in the village by

children and women as well as outside the village, in local and regional markets. Most of the interviewees were adopting the model for just one year, but one of the members is in her third year.

**She started with five crops and in this last period she is cultivating around 15 crops.** The economic aspect was also mentioned as they can produce their own food and avoid spending buying food in the market. They said that the husbands help them in the cultivating tasks and they are also pleased with the results, particularly with the health and income aspect. Some of the following reasons pointed for not adopting the model were related with: a) man does not permit his spouse to implement the area; b) labour problem, c) information, d) cultivate another crop in the whole area, in this particular case was grape. All participants mentioned that the severe drought prevented the expansion of the model.

### **Farming trends in the last years**

#### ***What is the history of farming practices here in the area?***

Two to three decades before, we used our own seeds and chemicals were not found. In that time the production was generally good and there was no need to use pesticides. In the last twenty years, farmers moved more and more to chemicals. Initially the yields with chemicals were good. However, for the last 10 years, the yield with chemicals is declining. For that reason we have now moved back to organic production. It is better. *Ms. Barkhabai Jadhav, Medsinga village*

#### ***What are the crops you were growing in the past?***

In the old days we did mainly red gram, other grams, rice, and buck wheat during the monsoon (kharif). In winter mostly wheat and sorghum were cultivated. *Ms. Barkhabai Jadhav, Medsinga village*

#### ***What are the crops that other farmer do here most today?***

Due to the drier climate, today many stopped to do rice. Since about 10 years soya has become a very important cash crop cultivated widely. The soya bean is rotated with mainly red grams during monsoon. The winter rotation is still sorghum and wheat.

Soya is so widespread because everybody follows everybody. We are like that. Earlier I did sugarcane, but that uses a lot of water. Hence, I shifted to soy bean that needs less water. Another advantage is that it is ready after 90 days. *Ms. Barkhabai Jadhav, Medsinga village*

#### ***What crops do you grow under the 1 acre model?***

We do many crops such as soybean, sesame, red gram, black gram, maize, vegetables (eggplant, okra, tomato, spinach, fennel, chili, cucumber and several leafs), and castor beans on the farm bunds. *Ms. Nanda Garad, Ansurela village*

## Appendix 5: Organic farming in India

### Organic farming and the debate on rural development in India

#### **Böll document of 2016 Agriculture India**

In spite of sustainability issues pertaining to overuse of chemicals, water and land degradation, organic cultivation (both certified and otherwise) has been taken up in the country mainly to meet the demand for organic food and clothing in western countries. However, owing to intervention from various Civil Society Organizations on toxic residues and land degradation, awareness on the importance of organic farming is growing. Organic farming is taken up by 650,000 Indian farmers in 0.51 million hectares of land (FiBL 2015). The figures correspond to 28.2% of world's organic producers and 0.4% of world's area under organic cultivation. Also, India with 5.18 million hectares of land under organic wild collection, occupies the third place in the world. Out of 784 affiliates of the International Foundation for Organic Agriculture IFOAM-Organics international, India occupies third place with 44 affiliates.

In spite of such impressive growth statistics, the overall importance of certified organic cultivation is still very limited. The 650,000 Indian farmers cultivating 0.51 million hectares of land corresponds to only 0.5% of farmers and 0.5% of agricultural land in India. Organic cultivation has been largely taken up to meet the export demands for organically grown food and clothing from rest of the world. There are other companies marketing organic produce such as 24 organic mantra, Plant rich Agritech etc. which are roping in farmers to take up organic cultivation of cereals, millets, lentils, spices etc. Several associations such as the organic farming Association of India (OFAI) are networks of Civil Society Organisations, farmers groups, farmer federations and other Community Based Organisations. Such entities provide extension services to farmers on organic farming, fair trade, certification, and entrepreneurship for rural development, natural resource management and conservation of agricultural ecology. Also, there are several private sector employees who have quit their jobs to take up organic cultivation. Disciples of spiritual gurus such as Sadhguru and Sri Sri Ravi Shankar have also taken up organic cultivation of food grains and vegetables.

The Ministry of Commerce<sup>52</sup> launched the “National Program on Organic Production” (NPOP) defining the National Standards for Organic Production (NSOP) and the procedure for accreditation and certification in 2000. A National Project on Organic Farming (NPOF) is being taken up by the Central government of India, which is being implemented from 10th five-year plan (2002-2007). National Centre of Organic Farming (NCOF) along with its six Regional Centres is implementing the scheme. In addition to promotion of PGS, NPOF aims at promoting organic farming through technical capacity building of stakeholders, transfer of technology, promotion of quality inputs and awareness creation. In order to come up with a package of practices for some important crops, ICAR launched a Network Project on Organic Farming (NPOF-ICAR) with 13 collaborating centres across the country. As part of 10th Five year Plan, Government of India has earmarked about Rs. 1,000 million for farming of standards, negotiating with different countries and putting in place a system of certification for organic products. Central Government is promoting the production and use of bio-fertilizer and has initiated a project “National Project on Development and Use of Bio fertilizers”. Some of the other efforts towards promotion of organic exports include attempts to collaborate with all the major organic importing countries. Towards this APEDA is deliberating with

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<sup>52</sup> <http://krishijagran.com/farm/scenario-in-india/2015/03/Organic-Agriculture-At-a-Glance>

the European Union for inclusion of India in the list of third countries under Article 11 of the EU regulations No 2092/91 so that India's National Programme for Organic Production gets the required recognition under the EU regulations.

### Organic certification

IFOAM has been promoting Participatory Guarantee Systems (PGS), an alternate solution to third party certification. India is one of the leading countries with 29.6% of producers from India certified under PGS. India now has 30 accredited certification agencies for facilitating the certification to growers. In India, farmers are empowered to be part of the certification process in order to make it participatory and affordable.

**Table 68: Production area under organic management**

S. No	Year	Area under organic management (Ha)
1	2003-2004	42,000
2	2004-2005	76,000
3	2005-2006	173,000
4	2006-2007	538,000
5	2008-2009	1,207,000
6	2009-2010	1,085,648

The Ministry of Agriculture has launched a farmer group centric organic guarantee system under the PGS-India programme. Under the program, certification is also being provided under various schemes such as National Horticultural Mission (NHM) (now Mission for Integration Development of Horticulture (MIDH), National Mission for Sustainable Agriculture (NMSA) and Rashtriya Krishi Vikas Yojana RKVY. Organisations such as Food Safety and Standards Authority of India FSSAI<sup>53</sup>) and Agmark are taking some steps to regulate the certification process for meeting the domestic demand. Organic products for export markets are certified by various certifying agencies accredited by the National Programme for Organic Production (NPOP), India, under Agriculture and Processed Food Products Export Development Agency (APEDA).

### Trade of organic produce in India

India produced around 1.35 million tonnes<sup>54</sup> of certified organic products such as sugarcane, oil seeds, cereals & millets, cotton, pulses, medicinal plants, tea, fruits, spices, dry fruits, vegetables and coffee. The total volume of exports during 2015-16 was 263.687 MT equivalent to 298 million USD. Organic products are exported to the European Union, US, Canada, Switzerland, Korea, Australia, New Zealand, South East Asian countries, Middle East, South Africa etc. So far 11 states, namely Andhra Pradesh, Karnataka, Kerala, Uttarakhand, Maharashtra, Madhya Pradesh, Tamil Nadu, Himachal Pradesh, Sikkim, Nagaland and Mizoram have drafted the organic agriculture promotion policies. According to APEDA, Madhya Pradesh has the largest area under organic certification followed by Himachal Pradesh and Rajasthan. Sikkim, a North Eastern state of India has been the first state in India to be declared as completely organic. The efforts in this direction started in the year 2003, when the Government banned the sale of

<sup>53</sup> <http://www.thehindubusinessline.com/economy/agri-business/centre-to-give-farm-exports-an-organic-booster-shot/article8793168.ece>

<sup>54</sup> <http://www.thehindubusinessline.com/economy/agri-business/centre-to-give-farm-exports-an-organic-booster-shot/article8793168.ece>

chemical inputs for the agricultural lands. Another North Eastern state Manipur has set up Mission Agencies to take up organic cultivation. The agency is working in 3000 ha of land in six districts of the state and plans to set up six organic companies with 500 farmers each by the end of 2016. However, there are other states such as Kerala, which intended to take up organic cultivation, but the plans could not take-off in full swing as consumers were not too keen to pay a premium for the organic produce.



## Appendix 6: Broader research concept

Research design: SSP India

Main research topics / Key impact areas	• Sub research topics /questions /variables	Household questionnaire	PRA Interview Guidelines	Comments - other methods
<b>1. Production</b>				
Better crop husbandry	<ul style="list-style-type: none"> <li>• Number of species, area for 3 seasons</li> </ul>	X		
	<ul style="list-style-type: none"> <li>• Intercropping</li> </ul>		x	
	<ul style="list-style-type: none"> <li>• Seed and how it is stored, produced, autonomy</li> </ul>		X	
	<ul style="list-style-type: none"> <li>• Yield of two crops food crops</li> <li>• Production sales gives yield</li> <li>• Reasons for better yields</li> <li>• Soil management, crop varieties, knowledge, low yield drought, climate events</li> </ul>	X		
Better land management	<ul style="list-style-type: none"> <li>• Land area bloc</li> </ul>	X		
	<ul style="list-style-type: none"> <li>• Land change related PRA questions, tenure, land grabbing</li> </ul>			Literature
	<ul style="list-style-type: none"> <li>• Collect information of soil analysis done</li> </ul>	X		Contact KVK
Better agroforestry	<ul style="list-style-type: none"> <li>• Tree numbers</li> </ul>	X		
	<ul style="list-style-type: none"> <li>• How do farmers perceive trees?</li> <li>• Role for shade, temperature, green manure, fodder appreciated, Competition with scarce land</li> <li>• Replanting rates</li> <li>• Wind breaks</li> <li>• Location for trees</li> <li>• Replanting problems</li> </ul>		X	
Better livestock husbandry	<ul style="list-style-type: none"> <li>• Number of key animals</li> </ul>	X		
Improved soil fertility	<ul style="list-style-type: none"> <li>• Composts</li> <li>• Green manure</li> <li>• Crop rotation</li> </ul>	X		

Main research topics / Key impact areas	• Sub research topics /questions /variables	Household questionnaire	PRA Interview Guidelines	Comments - other methods
	<ul style="list-style-type: none"> <li>• Increased recovery of manure and more biomass</li> <li>• Hindrances for uptake</li> </ul>		X	
Improved sustainable water management	<ul style="list-style-type: none"> <li>• Drip irrigation, sprinkler</li> <li>• Soil cover and mulch</li> <li>• Water tanks for harvesting water,</li> <li>• Tank de-silting</li> <li>• well and bore well recharging</li> <li>• Terracing</li> <li>• Water infiltration dams, structures</li> <li>• bunds, trenches</li> <li>• Improved water well management, well recharge, bore well recharge</li> </ul>	X		
	<ul style="list-style-type: none"> <li>• Water tanks for harvesting water,</li> <li>• Tank de-silting</li> <li>• Well and bore well recharging</li> <li>• Earth wall for retention . nalla bunds</li> <li>• Sustainability of boreholes</li> </ul>		x	
<b>2. Labour</b>				
Better labour management	<ul style="list-style-type: none"> <li>• Labour bloc, labour unit calculations, labours days</li> </ul>	X		
	<ul style="list-style-type: none"> <li>• Winter or summer migration, problems</li> </ul>		x	
Strengthening of shared labour (cooperatives, groups)	<ul style="list-style-type: none"> <li>• How is it organised?</li> <li>• How does it help the poor?</li> <li>• Are people ready to work for free for one another</li> <li>• Do you have a penalty system for members that do follow the group rules?</li> </ul>		X	
<b>3. Social empowerment</b>				

Main research topics / Key impact areas	• Sub research topics /questions /variables	Household questionnaire	PRA Interview Guidelines	Comments - other methods
Social empowerment of people	<ul style="list-style-type: none"> <li>• Bank account in women name</li> <li>• Membership in organisations</li> <li>• Personal marketing of women in the market</li> <li>• Decision taking within household before/now</li> <li>• Who controls the money</li> <li>• Leadership responsibilities within farm context</li> <li>• Women leadership skills, better position in the family</li> </ul>		X	
Promoting entrepreneurship	<ul style="list-style-type: none"> <li>• Marketing problems of entrepreneurs</li> </ul>		X	
<b>4. Food security</b>				
Better food security	<ul style="list-style-type: none"> <li>• Number of month food secure</li> <li>• Changes in diet</li> <li>• Value of subsistence food production</li> <li>• Women specific consumption</li> </ul>	X		
	<ul style="list-style-type: none"> <li>• Food sharing in the family</li> </ul>		X	
	<ul style="list-style-type: none"> <li>• Major agricultural production trends (imports and exports)</li> <li>• Sustainable intensification</li> <li>• Progress towards reduction of malnutrition past and future intensions</li> <li>• Climate change debate</li> <li>• Government view and NGO view, donors views</li> <li>• In how far have national policies related to food security impacted on the situation?</li> <li>• What is the debate on conventional versus organic production?</li> <li>• How to feed India by 2050? 1.2 to 1.6 billion people?</li> <li>• CO2 reduction strategies and policies</li> </ul>			Literature study local consultant

Main research topics / Key impact areas	• Sub research topics /questions /variables	Household questionnaire	PRA Interview Guidelines	Comments - other methods
	<ul style="list-style-type: none"> <li>• Food crops versus energy crops and biofuels, what is the national debate</li> </ul>			
<b>4. Health</b>				
Better Health	<ul style="list-style-type: none"> <li>• Health care expenditure</li> </ul>	X		
	<ul style="list-style-type: none"> <li>• Access and quality of health services</li> </ul>		X	
<b>5. Resilience</b>				
Increased resilience and higher reserve funds	<ul style="list-style-type: none"> <li>• Indirectly: Income, Savings, biodiversity, compost production, production yields, marketing strategies, membership in organisations, soil fertility management, Level of attending to trainings or workshops, capacity building events, promote polycentric governments (connectivity)</li> </ul>	X	SHG case study	See Andre africa study indicator list example cuba
CO2 footprint and adaptation to climate change	<ul style="list-style-type: none"> <li>• Production footprint: key crops, fertilizer levels, fuel utilisation levels, energy consumption</li> </ul>			Literature comparison
Reduction of desertification	<ul style="list-style-type: none"> <li>• Fuelwood saving technologies applied</li> <li>• What types of fuel are used</li> </ul>	x		
Improved cooking technologies	<ul style="list-style-type: none"> <li>• Less smoke with systems</li> <li>• Gained time in cooking</li> </ul>		X	
	<ul style="list-style-type: none"> <li>• Theoretical considerations on resilience for sustainable food systems as a model</li> </ul>			Literature review André
<b>6. Income</b>				
Better income	<ul style="list-style-type: none"> <li>• Income off-farm, Government subsidies, income farm, subsistence income,</li> <li>• Reduced debt</li> </ul>	X		
Reduced expenditure	<ul style="list-style-type: none"> <li>• Analysis of expenditure patterns</li> <li>• Reduce spending on chemicals</li> <li>• Level of investment in education</li> <li>• Level of investment in farming</li> </ul>	x		

Main research topics / Key impact areas	• Sub research topics /questions /variables	Household questionnaire	PRA Interview Guidelines	Comments - other methods
Investment in assets	• List of key assets	X		
Better quality of life	• Perceived change of quality of live	X	X	
	Visioning your future		X	
<b>7. Dissemination of farming concepts</b>				
Extension system	• Frequency of extension • Quality of extension	x		
Scaling- up concepts	• In how far have the methods already been disseminated • Question to SSP • National achievements			Local consultant
	• What would be the effects if this type of production was to become the norm			Scenario writing André Local consultant
Framework conditions and political context	• Are the political framework conditions conducive or obstructive? • What needs to be asked of the political arena, funding organisations, consumers and other players?			National statistics, Literature  Local cons
	• Is the set of improved agricultural methods of value to other target groups, e.g. for replication or source of inspiration and adaptation?			Literature, other studies IASTD

## Appendix 7: Household expenditure

### *Household expenditure*

The level of household expenditure is showing a strong variation within each group and this is related to the differences in income (see chapter 4.5).

It can be observed that the upper income groups expenditure matches rather well with income, while the lower income groups expenditure is too high compared to their income situation. This may relate to the drought and people rely on loans to satisfy basic consumption needs. Overall, expenditure does not show major differences between the study groups. Both groups spent close to Rs. 84,000 annually and the little differences are not statistically significant.

**Table 69: Household expenditure for selected food items in 2015 (Rs.)**

Expenditure		P10	P50	P90
Salt, sugar, cooking oil, soap	Reference	7,000	18,000	28,700
	SSP	9,048	18,000	30,000
Vegetables	Reference	1,000	4,800	9,600
	SSP	0	4,800	9,600
Meat, fish and eggs	Reference	0	3,180	14,400
	SSP	0	2,510	12,000
Pulses	Reference	0	2,295	6,400
	SSP	0	1,800	5,040
Milk	Reference	0	2,045	7,957
	SSP	0	0	7,200
Wheat	Reference	0	600	6,000
	SSP	0	480	4,980
Rice	Reference	120	360	2,940
	SSP	120	360	1,800
Millets (Jowar)	Reference	0	0	4,000
	SSP	0	0	4,000

Out of all expenses, SSP spent 37% on food items and the reference group 40%. The data is shown in the next table and ranked according to importance in the median groups. Among food items, the highest costs are spent on sugar, salt and cooking oil, followed by vegetables and then eggs and meat. Unlike expected, the spending in the SSP group on vegetables is not much lower than in the reference group. In the P10 group, spending is zero in SSP against Rs. 1,000 in the reference group, and also in the P95 (see

Table 48 in appendix 1) a small reduction is visible, however, the small and inconsistent differences fall behind expectations. The only more substantial difference is related to milk where all median and upper income sections spent less. Based on the analysis of food produced, it would have been expected, that food spending would be lower than what is found here. The study team can not find a clear explanation for these findings.

**Table 70: Household expenditure on non-food items (Rs.)**

<b>Expenditure</b>		<b>P10</b>	<b>P50</b>	<b>P90</b>
Clothing	Reference	3,000	7,000	15,000
	SSP	3,000	7,000	12,000
Health care and medical	Reference	1,000	5,000	40,000
	SSP	500	5,000	30,000
Energy, kerosene, electricity	Reference	500	2,000	4,000
	SSP	510	2,000	3,600
Contributions to ceremonies/funerals	Reference	0	2,000	10,000
	SSP	0	2,000	8,000
Transportation costs	Reference	0	2,000	6,000
	SSP	0	2,000	7,000
Education	Reference	0	1,000	22,300
	SSP	0	2,500	30,000
Mobile bills	Reference	364	1,200	3,600
	SSP	600	1,450	6,000
Drinks and leisure	Reference	0	0	14,700
	SSP	0	0	14,200
Consumption expenses (radio, TV, etc.)	Reference	0	0	2,000
	SSP	0	0	6,980
<b>Total household spending (all items)</b>	<b>Reference</b>	<b>39,200</b>	<b>85,300 ns</b>	<b>332,000</b>
	<b>SSP</b>	<b>43,800</b>	<b>83,800 ns</b>	<b>255,000</b>

Similar, the spending on non-food items shows no major differences between the study groups. The highest cost is clothing, followed by expenditure for health and energy. Expenses for transport and education are on a similar level. The SSP farmers invest more on education and this is very visible in the upper income groups (P90). This can be rated as a strategic investment in the future of the family. However, the average farmers (P50) appear left behind, as their level of investment into education reaches only less than 1/10th of P90 group for SSP farmers, in the reference group the discrepancy is even 1/20th.

The level of spending on communication for the average farmers is on the same level as for education. This highlights the importance of communication for households today. This importance is further illustrated by the fact that even the P10 households are spending money. Expenditure on leisure and small luxury items like TV was very limited.