Feminization of agriculture: trends, interpretations and driving forces using micro-level evidence from the VLS villages of India

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Feminization of agriculture: trends, interpretations and driving forces using micro-level evidence from the VLS villages of India.

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Abstract

There is a growing recognition of the phenomenon of increasing feminization of agriculture but the causes, consequences and the extent varies by region and this is not fully understood. The central argument of this paper is that increased number of women into agriculture – both as producers and or labor- is bought about by technological change, changes in cropping pattern and diversification of income sources including rural out migration. All of these lead to change in the traditional gender division of farm work. The objective of this paper is to examine women's and men's time use patterns, and labor participation in agriculture over time and the implications of these changes for policy to achieve gender equality. Such evidence assumes greater significance in the harsh, vulnerable environments such as the semi-arid tropics of India and Africa which are facing acute water shortage, continuous drought as well as a policy bias towards rain fed agriculture, and a prevalence of rigid gender, social and cultural norms dictating women.

The paper uses micro-level evidences from the longitudinal panel surveys carried out by ICRISAT's Village Dynamics Studies in South Asia (VDSA), formerly called as Village-level Studies (VLS), which has been running from 1975 to now, tracking the same households and individuals over time in selected villages of India.

The descriptive statistics and analysis of the data from the 6 villages of the semi-arid tropics (SAT) confirms the assumption and argument that women play multiple roles and spend time on several activities including productive work – both farm, non- and off-farm, domestic work and other reproductive work like child and family care. Compared to men, women spend four times more time on domestic activities and in the care economy – taking care of all the members of the household including children, the elderly as well as sick members. A focus on time spent in agriculture and related activities, the analysis informs us that women spend almost double the number of hours per hectare on agriculture activities either on their own farms or as paid labor. Sowing, weeding, harvesting continue to be the dominant activities for which women spend about 75-80% of their time in agriculture. The analysis also indicates that in the event of rising wages in the rural areas, women (especially family female) substitute for male labor and perform activities performed by men. The time-use analysis and the changing cropping patterns in the rural areas of the SAT confirm that activities performed by men are mechanized, freeing them from agriculture into other farm or non-farm activities, including migration to towns and cities. The activities that women perform

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dominantly on the crops that continue to be grown in these areas are not mechanized, women participate more in agriculture due to migration of the economically active men and sometimes women and hence there is seen a progressive feminization of agriculture in these regions.

Technological empowerment, unmediated control and ownership of land, enhancing of agricultural management skills and knowledge of women in agriculture are ways by which agricultural production could be improved thus bringing about gender equality.

Key words: feminization of agriculture, labor use, time use patterns, semi-arid tropics

1. Introduction and background

It is now widely recognized and well accepted by the development community globally as well as regional, local organizations and governments that agriculture is an engine of growth for reducing poverty. Agriculture continues to be a dominant occupation in rural Asia and sub-Saharan Africa. Alongside this, there is also a growing recognition that women are now playing greater roles and making essential contributions to agricultural and rural economies in the developing countries. Women are often managing complex households and multiple livelihood strategies (FAO, 2011) in bringing about rural transformation in general and agricultural transformation in particular. However, their roles vary considerably between and within regions and are changing rapidly in many parts of the world, where economic and social forces are transforming the agricultural sector (FAO, 2011). Their activities are also spread along the continuum from producing agricultural crops, participating in the non-farm sector through wage employment and small entrepreneurs, livestock and allied activities, post harvest processing, marketing and trade, to collecting fuel and water, domestic activities like food preparation, participation in the care economy of the household as well as participation in community activities and group action. As reiterated in the FAO (2011) report, many of these activities are not defined as "economically active employment" in national accounts but they are essential to the wellbeing of rural households.

Agriculture will continue to be critical to the future of India and also to many other developing countries where the population is predominantly rural and whose livelihood is dependent on farming/agriculture. The green revolution technologies and a vigorous smallholder sector have seen Asian agriculture undergoing a major transformation in the last five decades (Viswanathan et.al., 2012). Literature also reveals that this transition has not been uniform across Asia and the future of smallholder agriculture faces several challenges. In India, the structural transformation is a stunted transformation (Binswanger, 2012). One of the driver as well as an outcome of this transformation/transition is feminization of agriculture, though the degree varies across regions and countries. The roles of women in agriculture have increased during the last two decades and women now have broader and deeper responsibilities in agriculture – both in subsistence agriculture as well as in commercial farming. There is also evidence of the blurring of the traditional gender segregation of roles in agriculture.

Feminization of agriculture, in its simplest and broader term, refers to women's increasing participation in the agricultural labor force, whether as producers, as unpaid family workers, or as agricultural wage labor. Broadly understood, it means the increased importance of women's role in agriculture, whether as measured by the ratio between women and men in this sector or whether it is reflected in the high proportion of women whose main occupation /employment is agriculture. Depending upon the existing agricultural and livelihoods system, feminisation can mean slightly different things in the context of agriculture in different countries. It is therefore imperative that to understand recent trends in women's work in agriculture, it is useful to locate them within the broader agricultural context (Susana, 2006).

The objective of this paper is provide an enhanced understanding of the role of women in Indian agriculture, to assess whether or not agricultural feminization has been occurring, and if so, the driving forces behind this trend. Towards this, the paper examines women's and men's time use patterns and labor use in agriculture over time and understand the process of feminization of agriculture in the semi-arid tropics of India. The paper is organized as follows: section 1 presents a brief introduction to the issues, section 2 provides a brief review of literature on feminization of agriculture, time use , labor participation in agriculture and the corresponding conceptual framework; this is followed by a description of the methodology, and the data sources. The results and discussion are presented in section 4. The paper ends with conclusions and the references cited in the paper.

2. A summary of evidences from the literature

It is observed from a review of literature and evidence from the past that as a general pattern as countries climb up the development ladder, the relative weight of the agricultural sector is reduced, whether it is measured as its contribution to the total GDP or as the proportion of the workforce that it employs (Schutter OD, 2013). In developing countries in particular, this agrarian transition is deeply gendered. Male out-migration for longer periods and higher education allow them to seek off-farm employment. Women on the other hand are constrained by time and limited mobility and therefore are more likely to engage in agricultural work within the rural areas. It is also be recognised that the share of women's employment in agriculture varies by crop, varies by activity and varies also by age and social group (Pang et al. 2004; Zhang et al. 2004, SOFA team and Cheryl Doss, 2011).

Before going on to review the literature about what feminization of agriculture means, the authors present a brief overview on the agriculture scenario in India in the last three decades. The brief review is drawn mainly from the works of Saxena NC (2012) and Binswanger-Mkhize (2012). From the analysis of Saxena NC (2012), it is clearly evident that despite India's remarkable economic growth over the past two decades the progress in achieving gender equality and women's empowerment has been unsatisfactory so far.

Based on the analysis of the NSSO data, two trends on women's role in agriculture emerge: a. women who were classified as workers, a greater proportion of them worked in agriculture when compared with men (79% Vs 63%); b. women's share in the total number of agricultural workers is

increasing over time leading to increased involvement in agriculture (Saxena NC, 2012), women's responsibility both as workers and as farm managers has been growing, leading to an increased feminization of agriculture (figure 1, pg 9, Saxena NC 2012). His report further reveals that 56 percent of all women agricultural workers in the country are in primarily rain-fed states.

The agricultural scenario (with a focus on crop sector alone) in India showcases different features:

a. 1970-85: Green revolution phase, with agricultural intensification in the areas covered by the green revolution
b. 1990-91 to 1996-97: period of growth explained by the rising index number of crop production
c. Since 1996-97 to 2009-10: Stagnant, indicating that agricultural production has been stagnating since the last 13 years

Similar trends are also noticed when the entire agriculture sector is considered and not just the crop sector- growth rates in agriculture sector have also been falling over time. Saxena NC (2012) further concludes that the period post 2010 is obvious that Indian agriculture is in a serious crisis.

Binswanger –Mkhize (2012) associates the economic growth of India which is rapid but delayed with a stunted structural transformation, in which the rural non-farm sector has picked up the slack in urban employment growth. An analysis of the Papola TS (2012) highlights the major structural aspects of India's economic growth specially over more than three decades in the past from the viewpoint of its long-term sustainability. One of his conclusions relate to the declining share of agriculture in the economy since six decades (57% in 1950-51 to 16% in 2009-10).

From the writings of Saxena NC (2012), the agriculture scenario in India can be best described in three developments - stagnation, change in policy from investment to subsidy, and credit squeeze. These three developments have adversely affected women and both the authors – Binswanger-Mkhize (2012) and Saxena NC (2012) in their analysis point towards a progressive feminization of agriculture.

As discerned by Saxena NC (2012), it must be recognized a number of factors determine women's participation in agriculture. These include agro-climatic-ecological factors or conditions such as subsistence agriculture or commercial, availability of irrigation or persistent drought like conditions, type of crops, degree of diversification – both of income source/livelihood sources, and of agriculture, technological advancements and use as well as socio-economic-cultural factors including poverty, land ownership, rigid caste, class and gender and cultural norms; investments in education, human capital, social mobility and availability of non-land employment opportunities. The following section provides an overview of the many meanings of the term "feminization of agriculture."

Papola (2012) argues that structural changes as reflected in the changes in the shares of agriculture, industry and services have broadly followed the same time pattern as the changes in growth rate but the contents of change have varied from period to period. Most of the literature discerns that the share of agriculture has continued to consistently decline over the past six decades: from 57 per cent in 1950-51 to 40 per cent in 1980-81 to 24 per cent in 1995-96, to about 16 per cent in 2009-10. On the basis of the observed patterns of growth and structural changes, Papola (2012) describes economic growth in post-Independence India as divided into four phases, each with its distinguishing features (Box 1) with the current scenario being decline in share of agriculture in GDP.

Box 1. Distinguishing features of the structural changes in India

Phase 1: Independence to Mid-1960s: This period saw a significant acceleration in the growth rate over the past decades marked by a high growth of industry, and a significant structural change with a large increase in the share of non-agricultural sector, especially of the industry in the national output.

Phase 2: Mid-1960's to 1980: This period was marked by a slower growth of GDP, accompanied by a deceleration in the growth of industry, a slower pace of structural shift from agriculture to non-agriculture and a very small increase in the share of industry.

Phase 3: 1980 to early 1990s: This period saw a sharp acceleration in growth rate, mainly contributed by services. Structural changes were also swift, with a large decline in the share of agriculture, but very little increase in the share of industry-services picking up the major share of the shift.

Phase 4: Easy 1990's Onwards: Growth continued at similar rate as 1980's, but declined during 2000-2004. Structural changes continued at an accelerated pace with share of agriculture sharply declining and services emerging as the major sector and with very small increase in the share of industry.

Within this phase, period 2005-10 has seen a sharp acceleration in growth rate, despite a slowdown in 2008-09. Share of agriculture has declined from around 20 to 16 per cent, that of services has increased from 54 to 59 per cent and that of industry has stagnated.

Source: Papola, 2012

The many meanings of "Feminization of agriculture"

The evidence base available in the literature clearly indicates that not only are women playing multiple roles in agriculture but also the scope and the breadth of their involvement has also increased over time. Women are now performing or engaged in activities that were earlier performed by men such as land preparation, and they are investing more work in cash crop production and also shouldering the responsibility of not just subsistence agriculture or small holder farming but also into commercialization of agriculture. This trend, driven by both socio-economic and socio-cultural-policy forces is also sometimes referred to as "Feminization of agriculture" The traditional gender segmentation of tasks in agriculture and livestock – men do heavier work and women do lighter work – is getting blurred. However, women continue to do the labor-intensive tasks and men do those tasks that are now becoming increasingly mechanized. Schutter (2013) understand feminization as the increased importance of women's role in agriculture, whether as measured by the ratio between women and men in this sector or whether it is reflected in the high proportion of women whose main employment is in agriculture. The author also opines that though a global phenomenon, the feminization of agriculture shows important regional variations.

Several other authors have also provided definitions for feminization of agriculture: a. an increase in women's participation rates in the agricultural sector, either as self-employed or as agricultural wage workers, ie., an increase in the percentage of women who are economically active in rural area; b. an increase in the percentage of women in the agricultural labor force relative to men, either because more women are working and/or because fewer men are working in agriculture (Katz, 2003: 33-35; Deere, 2005: 17). According to Cornhiel (2006), there are two types of feminization of agriculture, namely: feminization of agricultural labour (labour feminization) and feminization of farm management (managerial feminization). Feminization of agricultural labour is the process by which increasingly more of on-farm work is done by women, while feminization of farm management occurs in two ways. First, when women increasingly become primary decision makers on the farm; or second when they gain greater access to agricultural income (dominate the execution of specific agricultural activities in which income is collected); for example, marketing of crops and livestock.

As gleaned from the paper by Corta and Venkateshwarlu (1999), feminization of agricultural wage labour is partly due to the movement of men off-farm employment and into small enterprises. It is the result of men attempting to substitute themselves with cheaper female labour. Female labour is cheaper, more economically dependent and ultimately become less free than male labour.

There are three very different modalities through which agriculture is "feminized":

1. The first pathway can occur as a result of male finding off-farm employment and or migrating to urban centres for employment. Women are left to take care of their family farm. Thus women are involved largely in subsistence agriculture, despite the significant constraints they face. They may be supported by remittances from the male members to engage/hire labor for tasks they cannot perform (Paris et.al 2009)
2. A second pathway to feminization of agriculture is when women engage in agriculture and take family land not for consumption/subsistence purposes but for cash crops – for the market. Women face lot of constraints and barriers in this type of engagement and amy be less productive then men (UNDP 2003)

3. The third pathway of feminization of agriculture occurs when women take up wage employment – as paid labor on farms and sometimes large plantations which are located at some distance from the home and sometimes requiring migrating away from homes to the location of work for relatively long periods (Schutter OD, 2013)

It should however be noted that the three pathways represent different situations, present different kinds of opportunities and constraints and pose different policy questions and responses.

Ezumah and Domenco (1995) reported that despite the overlap in men and women's involvement in agricultural activities, there are still culturally attached differences, inequalities in their pattern of economic contributions. Women believe that they are deeply involved in agriculture while men tend to see female participation in this field as secondary. This raises several questions: What are the new roles women have assumed in agriculture? What are the reasons for taking up such roles? And what are the implications?

Brauw et.al. (2012) have shown that agricultural feminization is occurring in rural China and also report that when women manage farms they have equal access to inputs and resources, perform as well in terms of efficiency, and are as well-off as men in terms of asset holdings and human capital levels. The authors also opine that based on their conjectures, the policy implication for China (and for the rest of the world) would be to continue to do the things that have allowed China's markets to flourish. China's has however, invested heavily into the infrastructure that markets need to operate well: roads, communications, and accessible wholesale marketing facilities, open to all and lightly taxed. Equal human capital investments for men and women have almost certainly played a supplemental role. In another study on China it was found that labor migration by men had striking gender differentiated impacts with the increase in work time -both farm work and domestic work - being greater for lefy behind elderly women and girls then the elderly men and boys (Chang et.al., 2010)

A similar finding by Singh et.al. (2011) on the impact of labour out-migration documents that women left behind in the villages assume a major role in various farm activities resulting in the so-called 'feminization of agriculture'. It has also empowered the female members of the migrant households in terms of enhancing their decision-making role in various activities. The study has observed some policy implications in terms of formation of self-help groups or labour societies to help out-migrants, organization of training programmes for capacity building of women, more thrust on education a girl-child and development of infrastructure in the rural areas.

There were several studies that found that women were still considered as invisible workers and their roles in agriculture were not highlighted despite their high level of participation and strong presence in activities like sowing, transplanting and post-harvest operations and discrimination in wages (Singh and Vinay, 2012; Damisa and Yohana. 2007; Unnati et.al, 2011; Bala, 2010). Women in agriculture will be acknowledged when women improve their knowledge and gain access to new and necessary information (Dhaka et. al, 2012). Farid et.al (2009) opine that the primary need of women working or seeking employment in various agricultural and non –agricultural activities is to meet the basic needs of the family and to enhance the family income.

Pingali (2007) in his book chapter entitled,"Agricultural mechanization: adoption patterns and economic impact" using existing evidence indicates, that the equity consequences of mechanization have not been as severe or as widespread as they are presumed to be. Using examples and detailed analysis, he further argues that mechanization of power-intensive operations have had minimal equity effects even in the labor surplus economies of Asia. The switch from manual labor to mechanical or chemical technologies for control-intensive operations, such as weeding, has had adverse equity effects in low-wage countries. However, where markets have been allowed to function with minimal government intervention, control-intensive operations continue to be performed by human labor until wages rise due to increased labor withdrawal from the agricultural sector. Ultimately it is concluded that serious equity consequences are invariably associated with policies that inappropriately promote mechanization, such as subsidized credit for tractor purchase (Pingali, 2007).

Alluding to a class perspective (Box 2), Garikapati S (2009) argues that changes in agrarian relations in India are generally contextualized within the political economy of class struggle, where structural constraints of one's class are crucial determinants of individual behaviour (for instance, Bhaduri 1973, 1983a, Athreya et al. 1990, Ramachandran 1990, Harriss 1991, Kapadia 1995, Das 2007, Walker 2008). The substantive issues surrounding feminisation have also been debated within the

Box 2. Neo-liberalism and Marxism ideologies on feminization of agriculture

Studies concerned with feminisation of agricultural labour tend to be classified into either of the two deeply polarised ideologies of 'Neo-liberalism' or 'Marxism' that characterise the debate on agrarian change in India (Brass and van der Linden 1997, Olsen 1997, da Corta and Venkateshwarlu 1999).

Neo-liberals: The increase in demand for female labour is largely driven by the adoption of the 'green revolution' package that increased the number of labour days needed in those agricultural tasks that are exclusively or primarily women's work (papers published in the Indian Journal of Agricultural Economics, 40(3), 1985, Walker and Ryan 1990). That feminisation is largely demand-driven is supported by evidence of falling male–female wage differentials and a general improvement in working conditions (Walker and Ryan 1990, Hazell and Ramasamy 1991, Bennet 1992). These studies moreover argue that agricultural growth contributed to an increase in demand for non-agricultural goods and services, which resulted in (largely) male migration into non-farm work, thereby freeing up agricultural jobs for women (Bennet 1992).

Marxists: suggest that women's increased participation in agricultural labouring does not reflect upward mobility but is merely the result of an increase in pauperisation of smallholders and artisans (Byres 1981, Agarwal 1984, Mies 1986, Duvvury 1989). As landholdings became smaller and demand for modern agricultural inputs increased, women had to work for wages to supplement farm incomes. Backed by the evidence on men moving into cultivation and non-farm work while women are taking over agricultural wage labouring, these studies moreover argue that the process of feminisation is resulting in a 'gender based class division' between men as cultivators and women as wage-labourers (see da Corta and Venkateshwarlu 1999, Chaudhry 1994).

Adapted from Garikapati S, 2009

confines of class, where the process of feminisation is viewed as a continuum of the class struggle (see Byres 1981, Walker and Ryan 1990, Hazell and Ramasamy 1991, Bennet 1992, Brass and van der Linden 1997, Kapadia 1992, 1993, da Corta and Venkateshwarlu 1999).

It can be summarized from an extensive review of literature on labor participation of women that women play a pivotal role in agriculture - as female agricultural labour, as farmers, co-farmers, female family labour and (with male out-migration, widowhood, etc.) as managers of farms and farm entrepreneurs (Goswami and Bordoloi , 2013). The literature and the empirical analysis confirms that the nature and extent of women's involvement in agriculture, varies greatly from region to region, different farming systems, castes, classes and stages in the family cycle. Studies on women in agriculture conducted in India and other developing and under developed countries all point to the conclusion that women contribute far more too agricultural production than has generally been acknowledged.

And lastly, there are several papers that looked at the effect of agricultural work and the need for income on maternal nutrition, health knowledge, and health seeking behaviour, and the effects of commercialization, structural adjustment, and development on these linkages (Gillespie et. al., 2012). On the issue of commercialization, there are arguments on increased female labor participation leading to detrimental effects on child nutrition (Bhalotra, 2010); or a compromise in maternal and child nutrition due to over engagement in agriculture (Rani and Rao, 1995) and withdrawal and or displacement of women from the labor force with commercialization, mechanization, and development (Kaur 2005; von Braun and Kennedy 1994; Agarwal 2001) resulting in more time by women for the household. This paper alludes to some of these issues in the end.

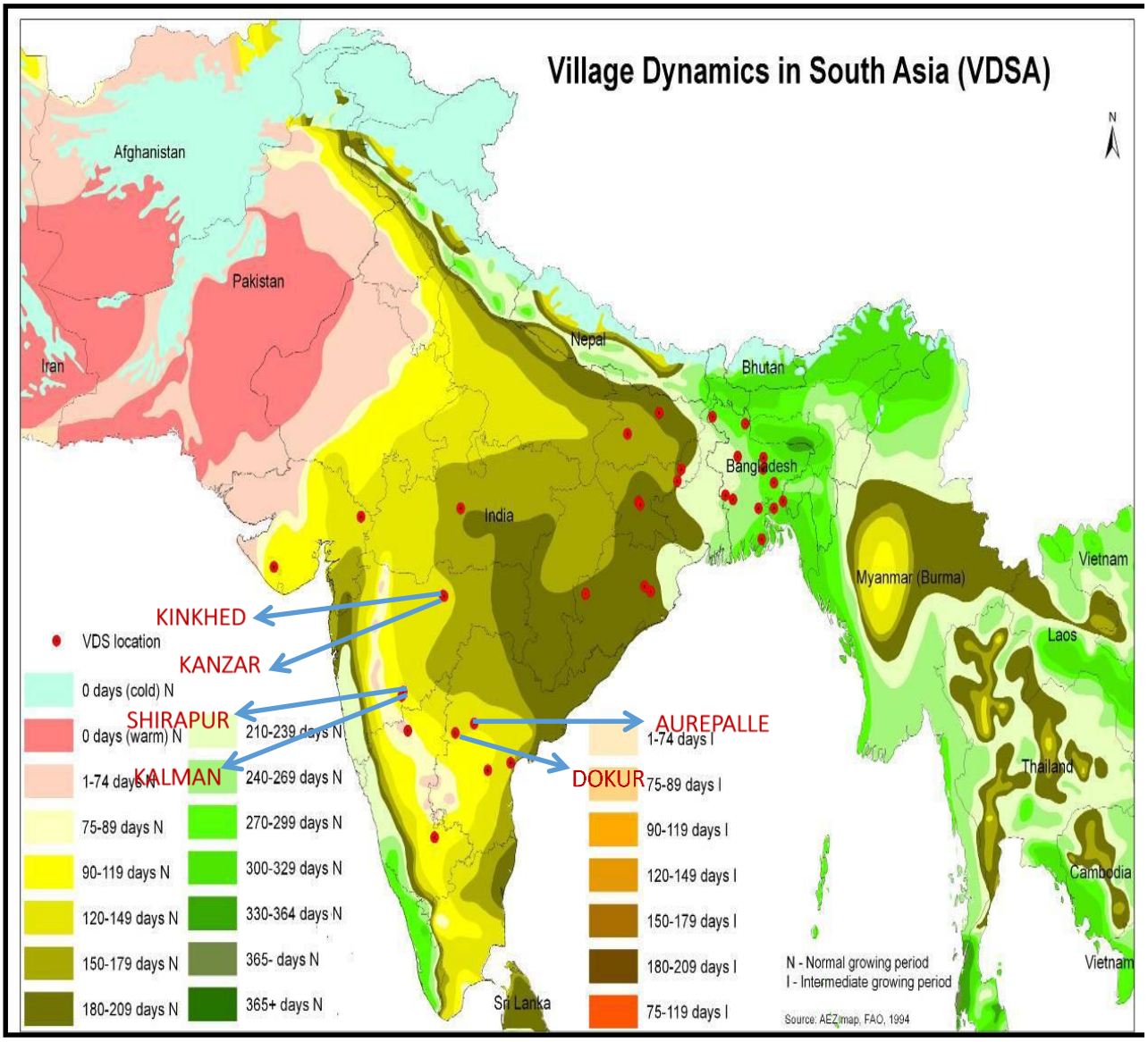
3. Methodology and data

This paper uses data collected as part of the ICRISAT Village-level Studies (VLS) now also called the Village Dynamics Studies in South Asia (VDSA). The longitudinal Village Level Studies of ICRISAT have for over four decades provided profound insights into the social and economic changes in the village and household economies in the semi-arid tropics (SAT) of Asia and Africa. These studies were initiated by ICRISAT at six locations in Telangana (the then united Andhra Pradesh) and Maharashtra states of India in 1975 and are continuing till 2014. Two villages each were included from Mahbubnagar district of Telangana and Solapur and Akola districts of Maharashtra (see www.vdsa.org for more details)[6]. The 6 villages continue to track the same households and individuals as in 1975 and hence are also referred to as the Dynasty households. The sample households in each village included four types of households based on their land holdings and were classified as large-land holding households, medium land-holding household, small-land owning

[6] The data on socio-economic and agriculture characteristics have been collected at regular intervals (3 weekly interval) from 240 households since mid-1975-1985, called the first generation VLS data. The studies were resumed in 2001, with varied frequency of data collection, tracking the same households that were selected in 1975, including the split-off and spin-off households of the original panel. Starting 2009, the studies have been expanded from 6 villages to 42 villages covering 30 villages from 9 states in India and 12 villages in Bangladesh.

households and also the landless (who do not own land at all or have very little land). The sample size consists of total 407 households (See figure 1 for the locations and table 1 on the sample size).

Figure 1. Location of the study villages



Source: ICRISAT VDSA 2009-2015

Table 1. Sample size in the study villages, 1975-2014 (the numbers given below correspond to the latest year – 2013-14)

	Number of Households surveyed				
Villages	**Total**	**Round 1**	**Round 2**	**Round 3**	**Round 4**
Telangana Villages	***123***				
Aurepalle	66	65	65	65	65
Dokur	57	56	54	52	55
Akola villages	***123***				
Kanzara	72	***78***	***77***	***78***	***78***
Kinkheda	51	50	50	50	49
Solapur villages	**161**				
Shirapur	97	94	94	94	93
Kalman	64	69	67	66	67
Grand total	**407**	**402**	**407**	**405**	**407**

	Number of Individuals surveyed (for the nutrition and time-use indicators)						
Villages	**Total**	**Adult men** (18 yrs. and above)	**Adult women** (18 yrs. and above)	**Boys [1]**	**Boys [2]**	**Girls [1]**	**Girls [2]**
Telangana Villages	***452***						
Aurepalle	228	89	89	6	24	5	15
Dokur	224	83	75	12	21	17	16
Akola villages	***740***						
Kanzara	292	112	99	12	33	9	27
Kinkheda	448	171	148	23	46	23	37
Solapur villages	***737***						
Shirapur	444	168	147	23	46	23	37
Kalman	293	109	108	15	31	10	20
Grand total	**1929**	**732**	**666**	**91**	**201**	**87**	**152**

1. Children between 0- 59 months
2. Children between 5 years to below 18 years of age

In 2013-14, with additional funding support from a CGIAR RESEARCH PROGRAM on Policies, Institutions and Markets (CRP PIM), a special purpose survey was implemented in the 6 villages of the VLS, with a focus on nutrition and women's empowerment. Additional data was collected from the dynasty households on time use, dietary diversity, nutritional anthropometry, assets and 24-hour dietary recall (food intake) to understand the nutritional status of the men, women and children of these households as well as understanding of empowerment of men and women in the harsh, fragile environments of the SAT. The special purpose survey collected data on a quarterly basis (4 rounds in all) to capture seasonality. The important characteristic of the special purpose survey is the availability of time use information in each round for all the members of the households who are 14 years and older in age. Thus this covered adolescent boys and girls, the most active male and female members of the household, who were mostly the household head and his/her spouse as well as the elderly members of the family. Time use information was collected for all activities reported by the respondents at an interval of 15mins each.

Both quantitative and qualitative methods of data collection were employed in generating and validating this data. Questionnaire surveys were implemented and data was collected from the principal male and female members of the household (members who were involved in making decisions in the household). In this paper the authors use the following data for the analysis and interpretations:

a. General household characteristics from the VDSA longitudinal panel and the special purpose gender and nutrition survey
b. Income data from the VDSA longitudinal panel (1975-2013)
c. Time use data from the special purpose gender and nutrition survey (2013-2014)
d. Labor participation data from the VDSA longitudinal panel (1975-2015)

Descriptive statistics and qualitative analysis from the above data is presented in the next section. The results and discussion presented are in two ways. Sometimes data from all the six villages is combined, analysed and interpreted. Sometime, to capture variation among and within the study location, the micro-level analysis is also presented based on the three different regions in the SAT: Drought prone region of Mahbubnagar; Assured rainfall region of Akola and Drought prone region of Solapur with access to canal irrigation (table 2). Time use and dietary diversity surveys were conducted every quarterly (4 rounds in all) in 2013-14 to capture seasonality and these correspond to the low, medium and high agricultural season intensity.

In summary, the analysis presented in the next section covers different periods of economic growth in India and the interpretations outline the distinguishing features of participation or engagement in agriculture by men and women during different phases of the economic growth in India. The analysis is presented at the following points in time (table 3).

Table 2. Classification of the study locations by region

Sl.No	Region	Represented by the study villages
1	Drought prone region of Mahbubnagar	Aurepalle Dokur
2	Assured rainfall region of Akola	Kanzara Kinkheda
3	Drought prone regions of Solapur but with access to canal irrigation	Shirapur Kalman

Table 3. Analysis points and phase of agriculture growth in India

Period	VLS-VDSA phase	Phase of economic growth (from agriculture sector point of view)
1975-76	Start of VLS panel surveys (high frequency surveys)	slower pace of structural shift from agriculture to non- agriculture
1983-84	Conclusion of the first generation of VLS surveys (high frequency surveys)	sharp acceleration in growth rate, mainly contributed by services. Structural changes were also swift, with a large decline in the share of agriculture
2001-02	Commencement of the second generation of VLS surveys (annual surveys)	Period of declining growth; agriculture sharply declining further
2005-06	Second generation VLS continues (high frequency surveys)	Sharp acceleration in growth rate
2009-10	Start of expanded VLS surveys (now called as VDSA surveys; expanded in scope and coverage; high frequency)	Period of stagnation - Slowdown in economic growth during the period 2008-09
2013-14	The VDSA survey closed with survey data from 2014	Stage of crisis

Source: Authors interpretations based on the review of literature

4. Results and discussion: descriptive statistics and empirical results

4.1 Time use by gender and region

Time use is now increasingly used as transformative indicator of gender equality. Time use analysis are related to unpaid care and gender inequality and are also a reflection of how gender roles attributed to women and men, girls and boys, shape the division of labour within a household (Ferrant, 2014), a community and in agricultural activities/operations. Gender and social norms within a community, or a cultural setting and context define many times certain activities as feminine and or masculine than others. This paper uses longitudinal data on participation in agriculture by men and women and provides an understanding how the social norms have changes with respect to feminine/women activities and masculine activities. This is an indication of empowerment of the communities as they are able to break away from the stereo-type roles performed by men and women and are able to challenge the societal norms towards this. Challenging the norms as a result of the changing external environment because of new technology, environmental changes and policy changes is a sign of empowerment.

Women, along with men, are involved in producing goods and services for household use, spending 6 and half hours a day on work, which includes farm work, livestock rearing and non-farm work. The farm and livestock work may be paid work or work in their own farms or taking care of their own livestock but most of this work supports the household. Women in the semi-arid tropics spend about 4hours every day on household chores, including cooking, cleaning, fetching water, washing, and gathering firewood which is about 3 times more than men (Figures 2a and 2b). Caring, cleaning, cooking and fetching water and fuel wood are all unpaid tasks predominantly carried out by women, and to a lesser extent, children nowadays, especially girl children in these regions. The time -use data based on a 24-hour recall, clearly shows that men spend less than one hour per day on unpaid household work including care work while women almost four times as men. That leaves an additional burden on time for paid employment. Leisure, including sleeping and resting, takes away about 31-33 % of the time in a day. However, it is interesting to note is that men and women view leisure differently, in the different regions of the SAT. More description on the perceptions of leisure by men and women is provided in the next section where the regional differences are discussed.

An examination of the time use patterns by gender in the three different regions of the semi-arid tropics (as presented in table 2) reveal that in terms of the time spent on farm work, livestock rearing and non-farm work, there is no significant difference in the time spent by women and men across the three regions. The difference in time spent is in domestic work and leisure (figure 5 – 5.1a, 5.1b and 5.1c). On an average women spend every day about 10-12 % of their time in doing household chores (2 hours 40 minutes to about 3 hours) while men spend about 2-4% of their time (about 45 minutes to one hour). A considerable chunk of time is spent on leisure by both women and men is the study villages, even if sleeping and resting time are separated. Women spend almost half the time (7-12 %) on leisure related activities compared to men which is about 10-15 % of their time. Even though there is not much difference in the leisure time by both men and women there is a considerable difference in what “leisure” means to men and women, in the different regions.

Leisure was interpreted as watching television, gossiping, discussing politics and participation in public political meetings by men in all the three regions – drought prone region of Mahbubnagar; the assured rainfall region of Akola and the region with access to canal irrigation of Solapur districts in the semi-arid tropics of India. For the men from the Telangana region, leisure meant two things - watching television/listening to radio and discussing politics. Majority of the men reported participating in political meetings and discussing politics as the main leisure related activities. This is important because when this data was being collected, the then state of Andhra Pradesh where Mahbubnagar is located was in the process of undergoing a bifurcation into two states – Telangana (Mahbubnagar will belong to Telangana) and the residuary state of Andhra Pradesh. So discussing the political ploys and tactics in bifurcation of the state was the most common activity for men. The concept of leisure as perceived by women in the three regions is presented in table 4.
For women, leisure was a time to be happy, talk to other people, do activities which give them happiness and also strength and confidence. It is also an opportunity to network with other women in the community and enhance and improve their social capital.

Figure 2a. Time use of men in the selected villages of the semi-arid tropics, India, 2013-14

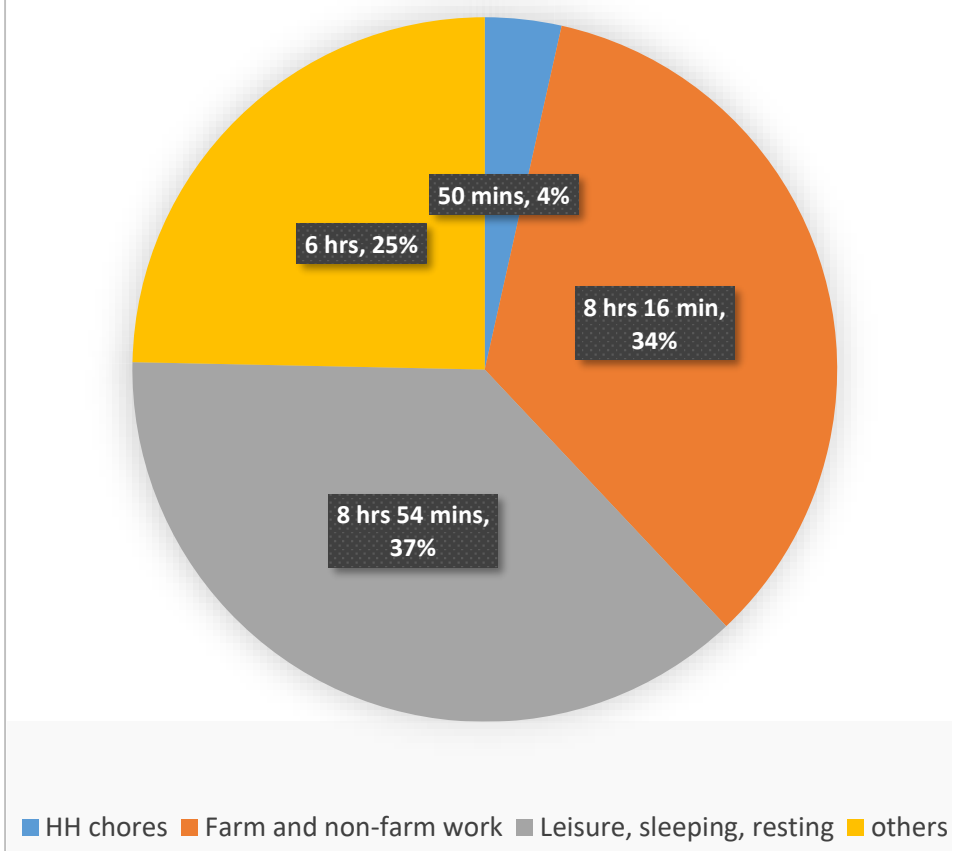


Figure 2b. Time use of women in the selected villages of the semi-arid tropics, India, 2013-14

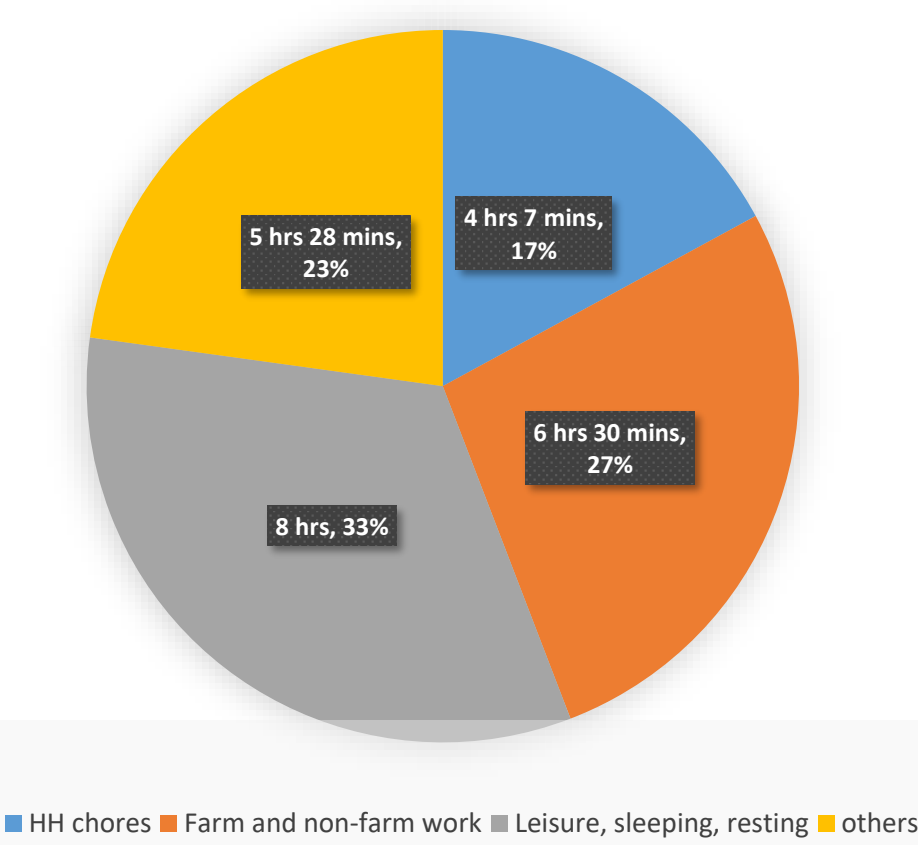


Figure 3. Time use patterns of women and men in the semi-arid tropics of India, 2013-2014

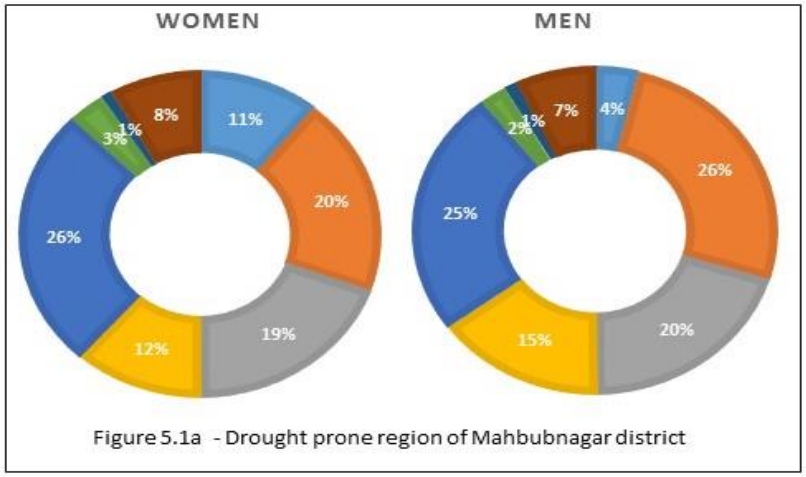


Figure 5.1a - Drought prone region of Mahbubnagar district

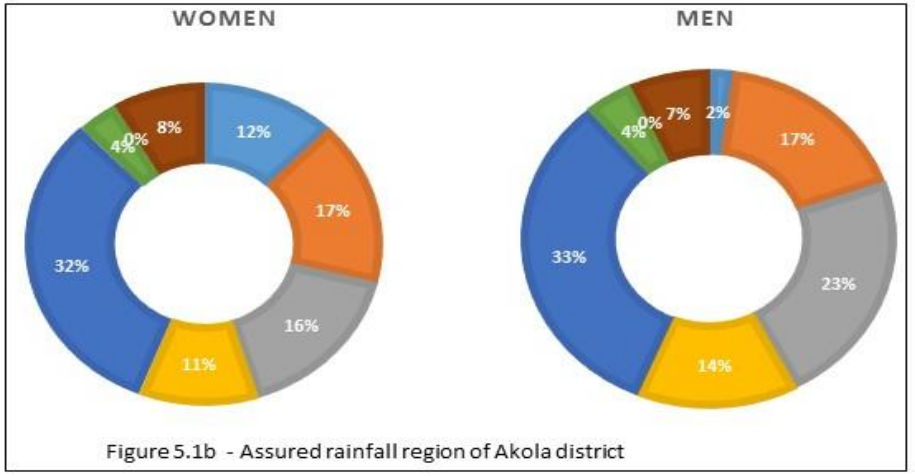


Figure 5.1b - Assured rainfall region of Akola district

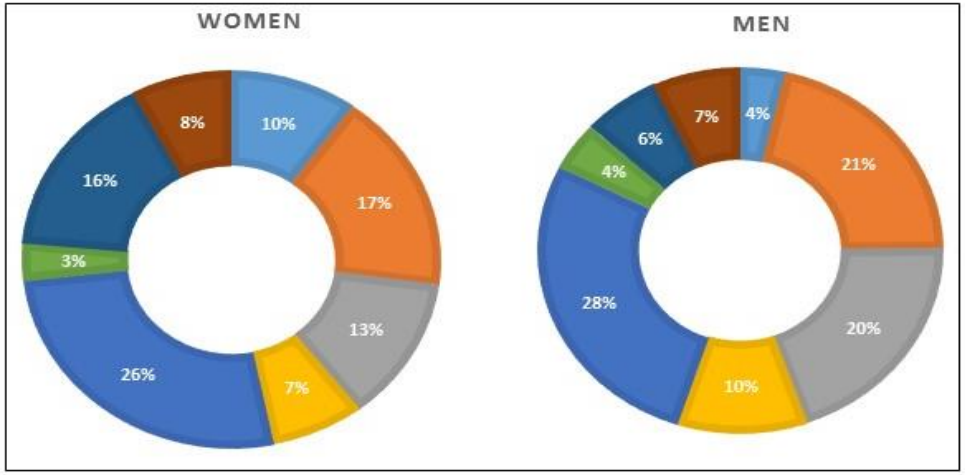


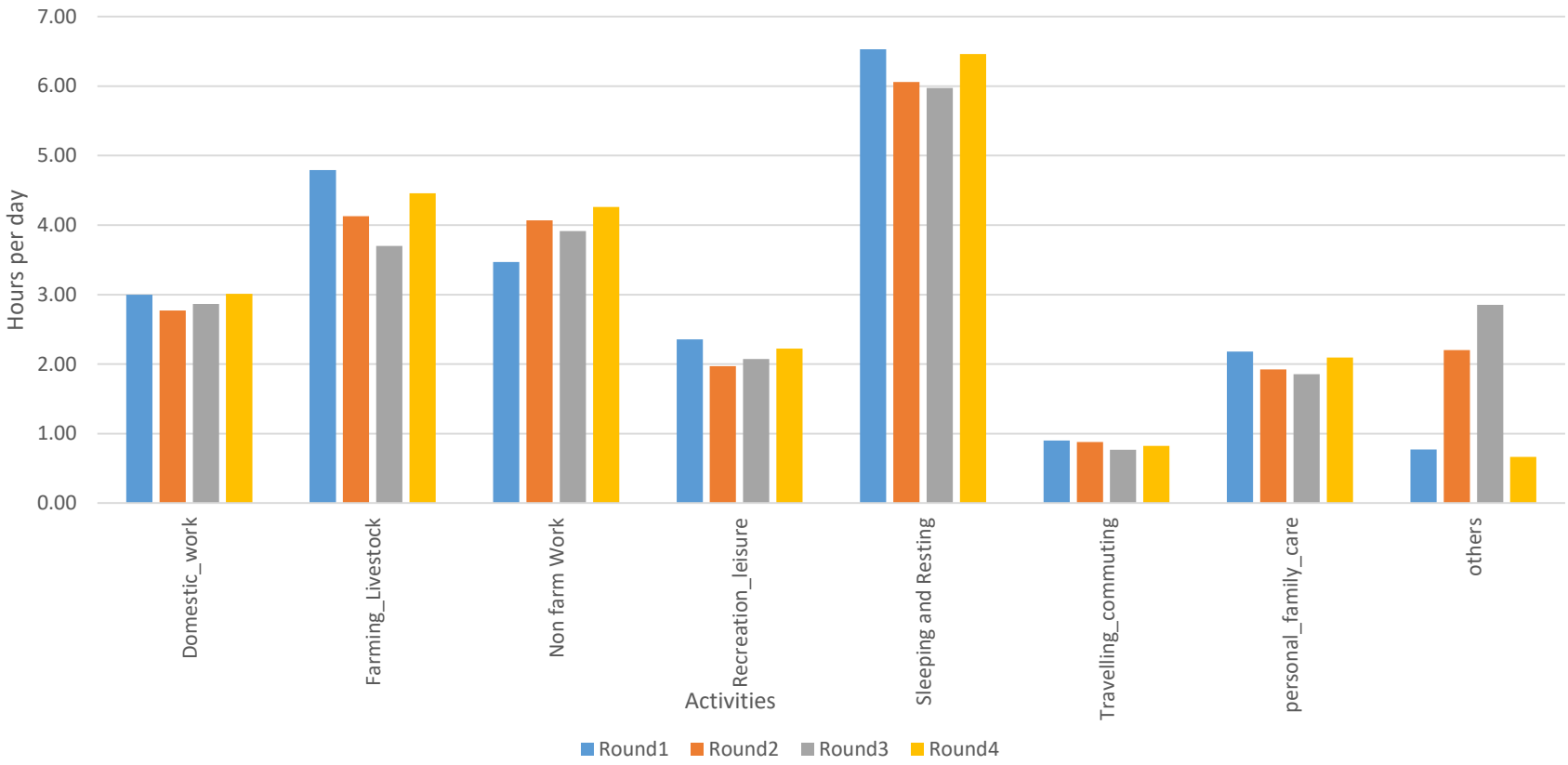
Figure 5.1c - Drought prone, with canal irrigation region of Solapur district

Table 4. Concept of leisure as perceived by women in the semi-arid tropics of India.

Drought prone region of Mahbubnagar	Assured rainfall region of Akola	Drought prone regions of Solapur but with access to canal irrigation
▪ meeting other women in the community, SHGs members and leaders and talk about the issues facing the villages, ▪ discussing about how to maintain the water taps installed at regular places in the villages, ▪ to gossip while doing sewing or embroidery on clothes for their family, ▪ to participate in social activities, religious events and functions (eg. Bathukamma festival) and ▪ to some women it also meant watching television.	▪ For the women of Akola district, where the pathway of development is through intensification of agriculture, leisure to them meant sorting, grading and storing seeds for the next crop/season (like seeds of pigeonpea which is a pulse crop). ▪ It also meant informal meetings and gossip with members of their own kin. Kinship networks are very strong in this region and are a major source of information for women. ▪ Community events especially religious events were also interpreted as leisure by women.	▪ Skill enhancement ▪ helping children in their school work ▪ being happy, mentally and physically relaxed and participating in social and community events ▪ Community events especially religious events were also interpreted as leisure by women.

Having discussed the time use patterns of men and women in the six villages in general, this paper also puts emphasis on the time use patterns of women between the age groups 18-49 years for interesting insights. As can be seen from Figure 4, women in the age group 18-49 years spend more time on all activities during the high agricultural intensity seasons (round 1 and round 4) except for activities under the 'other' category and 'non-farm' work. This is an interesting finding indicating that the time burdens on women in this age group are more during the high agriculture seasons, thereby women are more time constrained. Women reduce their 'other activities' during these periods. The 'other activities' include drinking local toddy, going to the market and running errands for the household.

Figure 4. Time use patterns of women between the ages 18-49 years, India, 2013-2014



When we compare the education levels and time burdens on women, our findings indicate that as the level of education increases women tend to spend more time on household chores which includes time spent on cooking, washing clothes and utensils, among others. On an average, as can be seen from the graph below (figure 5), compared to women with no education, women who have a graduate degree spend 40 mins more on domestic work, about one hour more on leisure activities and 40 mins more on family care. Illiterate women and women with no education beyond primary school spend less time cooking (& washing utensils). The data also reveals that even in the high agricultural season under time constraints, women do not cut down on child care time. Instead, they sacrifice about an hour of work outside the home and an hour of their leisure time.

Comparing income levels and time use patterns of women, our findings indicate that as income of the household increases women tend to spend more time on household chores which includes time spent on cooking, washing clothes and utensils; and on family care including personal care. On the contrary, women from both medium and high income groups spent less time on recreation and leisure activities (figure 6). As indicated earlier in the paper, leisure activities included participation in community and social events. Women from wealthier households (based on income) do not tend to participate in these activities because of the social status their households have in the community. Leisure and recreation to women from the high income class was restricted to watching television and gossiping with women within their families or kin and participation in their kinship activities.

When time use patterns of women are compared across the different farm size classifications – large land holding households, medium land holding household, small land holders and the landless category, it is clearly evident that land holdings do matter when it comes to women's time. It is found that women from large- and medium land owning households spend more time on farming. Time spent on family care, domestic work and leisure activities are not affected by farm size (figure 7). When enquired about the role of women from large-and medium land holding groups in farming activities, it was revealed that women either work on their own farms especially during labor shortage and or are supervising the labor working in their fields.

Using social groups as a level of disaggregation, an analysis of the time use patterns of women from different groups reveals that women from the backward class tend to spend an additional one hour on non-farm activities, compared with other groups. Forward caste women tended to distribute their time equally among the work major activities – domestic work, farm and non-farm work and family care (about 4 hours each) and the remaining time was spent on sleeping, resting, leisure and other activities. What is interesting to note is that women from Scheduled caste and tribes spent relatively more time on domestic work and family care as compared to farm and non-farm work (figure 8).

Figure 5. Time spent by women on household chores, family care and leisure, by education, 2013-2014

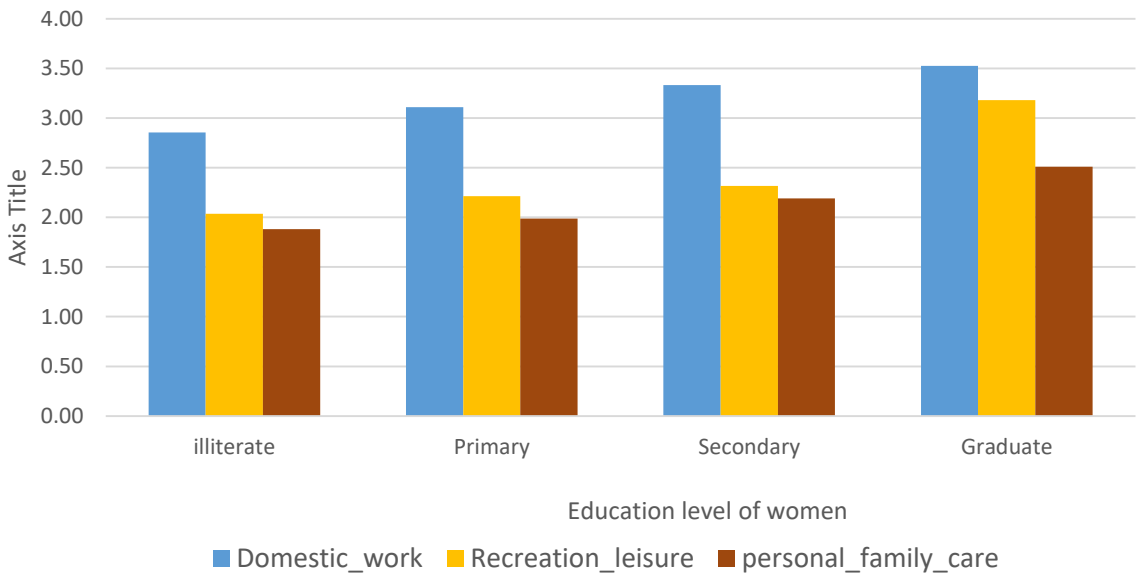


Figure 6. Difference in time spent by women, by income status, 2013-2014

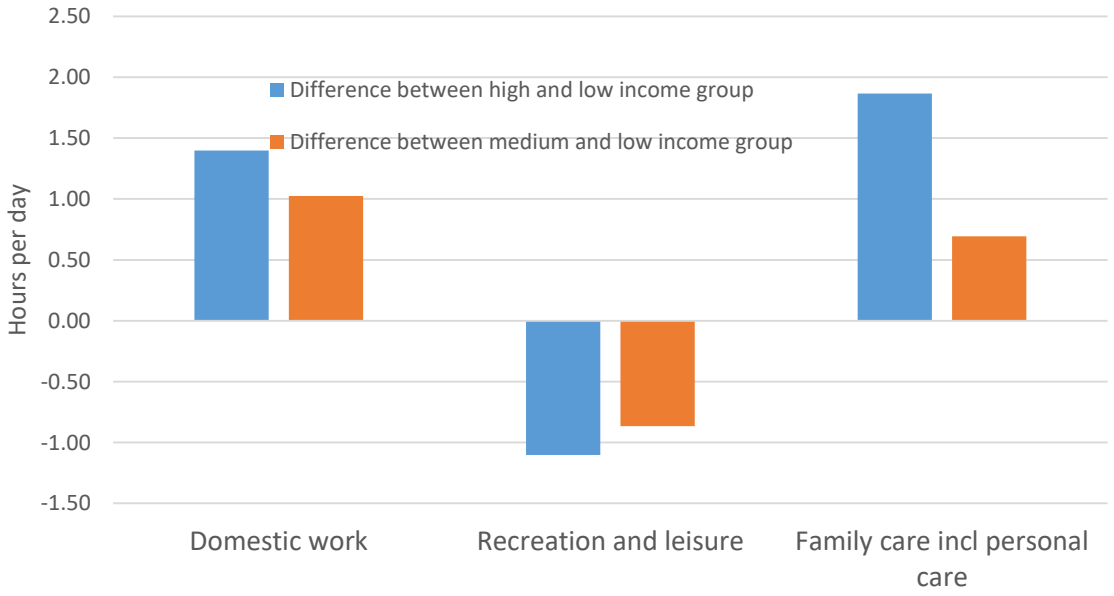


Figure 7. Time use patterns of women, by farm size categories, 2013-2014

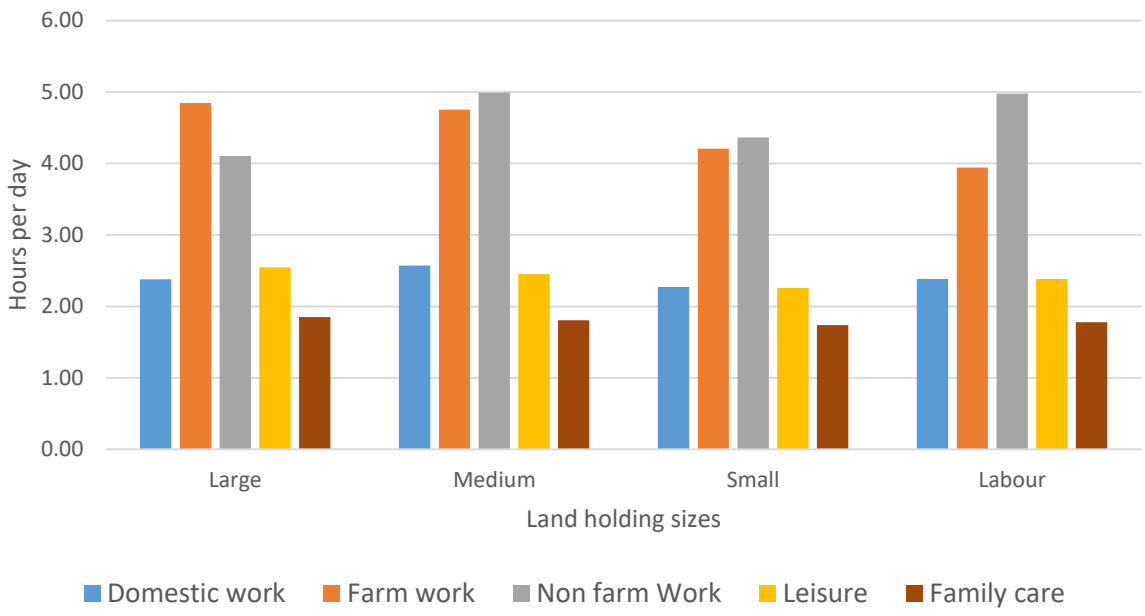
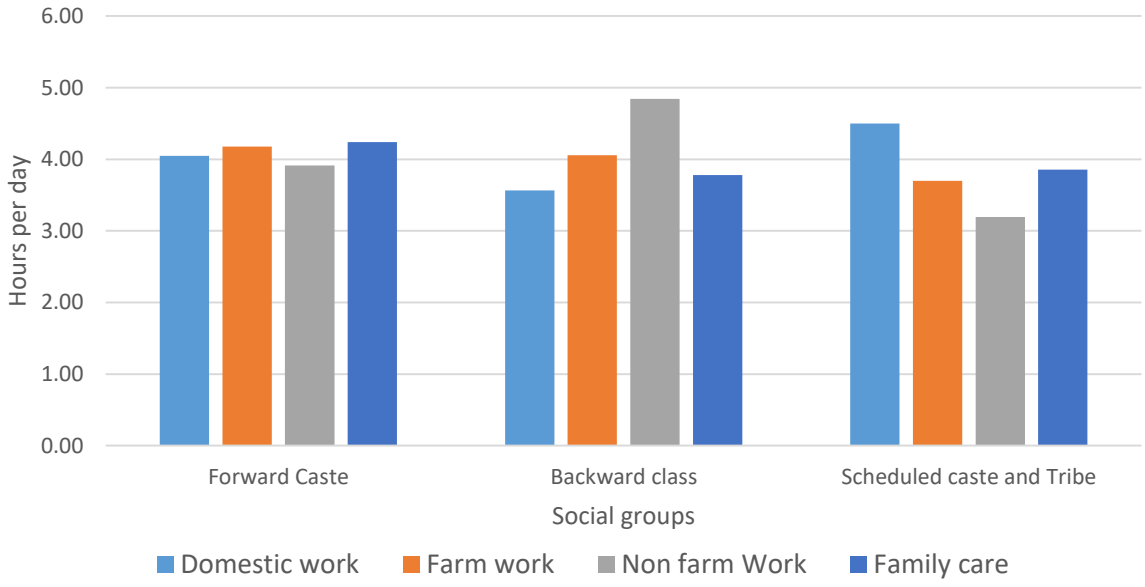


Figure 8. Differences in time use by women from different caste (social) groups, 2013-14



4.2. Gendered patterns of participation in agriculture

Labor participation data is one of the ways to understand and measure the amount of time spent by men and women on different tasks/activities/crops in agriculture. The analysis from the crop input and out-put module data from the VDSA villages since 1975-2014 reveals an interesting pattern. The descriptive analysis by presented village and region and is based on a flyer by Padmaja and Bantilan (2014) which describes the feminization of agriculture in the SAT.

Aurepalle and Dokur villages in drought prone Telangana, where the pathway of development is through diversification of agriculture and diversification of income sources including migration

The time allocation of women and men in agriculture in Aurepalle clearly shows that women are spending more time in agriculture as measured by the number of hours per hectare (figure 9a). The participation has increased three folds for women from 1975, when it was 258 hrs^{-ha} to 840 hrs^{-ha} in 2010. One of the reasons for this increased time of women in agriculture are the changes in the cropping pattern. Castor and sorghum were the dominant crops in 1975, which needed relatively less labor. However, starting 2001, these crops were gradually replaced by cotton which is a labor intensive crop, with more female labor requirement for harvesting/picking of cotton (Figure 9b).

Dokur is a village in Mahbubnagar district which was once upon a time flourishing in agriculture. The village experienced continuous dry spells and drought like conditions for a prolonged time (more than 8 years at a stretch). These conditions have led to farmers shifting from paddy, the dominant crop in the 1970s and 80s, to castor during the dry spell years. Alongside this, the village also has experienced migration of men and women to other towns and cities. The time allocation data and the cropping pattern data illustrate the declining participation of women in agriculture from 1975-2008/09. With good rains and the favourable environment post 2005, the data shows that paddy cultivation is increasing and thereby the roles of men and women in agriculture are also showing an upward trend (Figures 10a and 10b).

Kanzara and Kinkeda villages in rainfall assured Akola, where the pathway of development is through intensification of agriculture

In Kanzara, which shows a promise in agriculture through intensification, the analysis clearly shows that both men and women participate equally in agriculture. This trend is observed in the time allocation of men and women during 1975-1984/85 (figure 11a). During this period, diversification of agriculture is also seen (figure 11b). Cotton which is grown from centuries in this region, is the dominant crop and the area under this was increasing till up to 2003/04. During this period the time use patterns of women show an increased share in agricultural work. Starting 2007, Soybean has started gradually replacing cotton. Soybean uses less labor and hence there is a drop in the time allocation of men and women (figures 13a and 13b). Kanzara is also a village that uses more mechanization, which reflects more or less equal participation of men and women in agriculture. Similar trends are observed for Kinkheda as well (Figures 12a and 12b)

Kalman and Shirapur villages in the drought prone region of Solapur with access to canal irrigation, where the pathway of development is through intensification and diversification of agriculture into high value crops

Like in village Kanzara, Kalman and Shirapur villages show almost equal participation of women and men in agriculture (Figures 13a and 14a). The cropping pattern till 2001 in both these villages were basically chickpea, pigeonpea and sorghum as these villages were also drought prone. With the availability of water for irrigation through the canal, the cropping patter changed after 2001 to include more high value crops like sugarcane, vegetables and wheat in Shirapur (Figure 13b and 14b), while Kalman continued to grow the crops of the SAT and hence low participation of women and men in agriculture. Kalman is one village in the SAT which has invested in education of its children – both boys and girls. This village saw a rise in salaried jobs with majority of them joining as school teachers in the nearby villages and towns.

To summarize, the sociological analysis from the long-term panel data from 1975 clearly points to evidence of a progressive increase in participation of women of agriculture in the rural areas, although the extent is varying across regions (Padmaja and Bantilan, 2014). The analysis and the insights reveal that in regions that have a promise in agriculture (eg. Village Kanzara), and favour sustained dependence in agriculture, men and women jointly participate in agriculture as they were doing so since the early 70's. The role of women in agriculture increased in these cases but to a lesser extent. However, in regions which have experienced shocks (such as the Mahabubnagar villages), women have a greater role and engagement in agriculture depending on the coping strategies the household adopts - changing cropping patterns and diversification; working as paid labor on others farms and lastly male members of the household migrating to towns leaving the women to take care of the farms as well as participate in the care economy. This finding is also echoed by Binswanger-Mkhize (2012) in their analysis of the structural transformation in India. The analysis also shows that female time-use in agriculture varies by crop, production cycle, wealth (income and land holding status) and social group. These are explored in the next section.

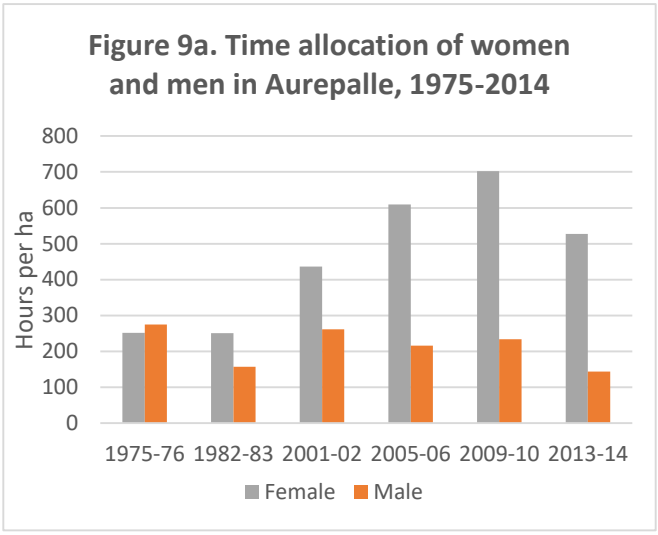


Figure 9a. Time allocation of women and men in Aurepalle, 1975-2014
Hours per ha
800
700
600
500
400
300
200
100
0
1975-76 1982-83 2001-02 2005-06 2009-10 2013-14
Female Male

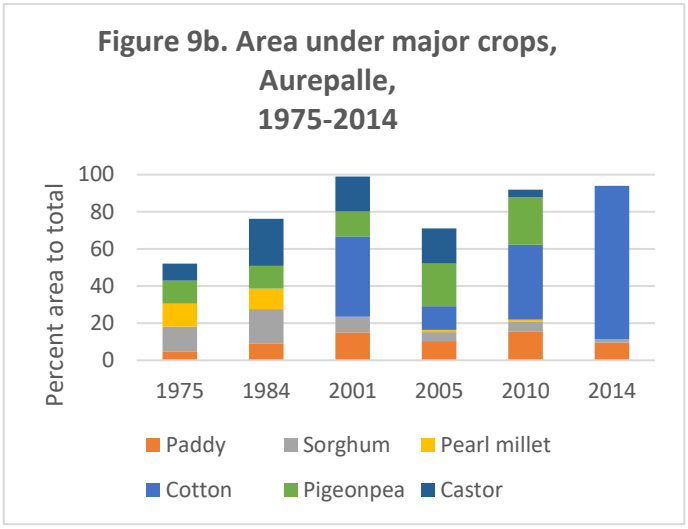


Figure 9b. Area under major crops, Aurepalle, 1975-2014
Percent area to total
100
80
60
40
20
0
1975 1984 2001 2005 2010 2014
Paddy Sorghum Pearl millet
Cotton Pigeonpea Castor

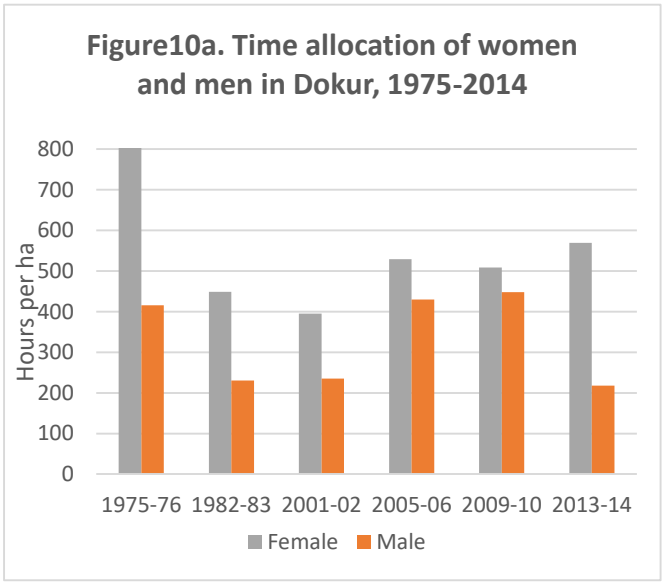


Figure10a. Time allocation of women and men in Dokur, 1975-2014
Hours per ha
800
700
600
500
400
300
200
100
0
1975-76 1982-83 2001-02 2005-06 2009-10 2013-14
Female Male

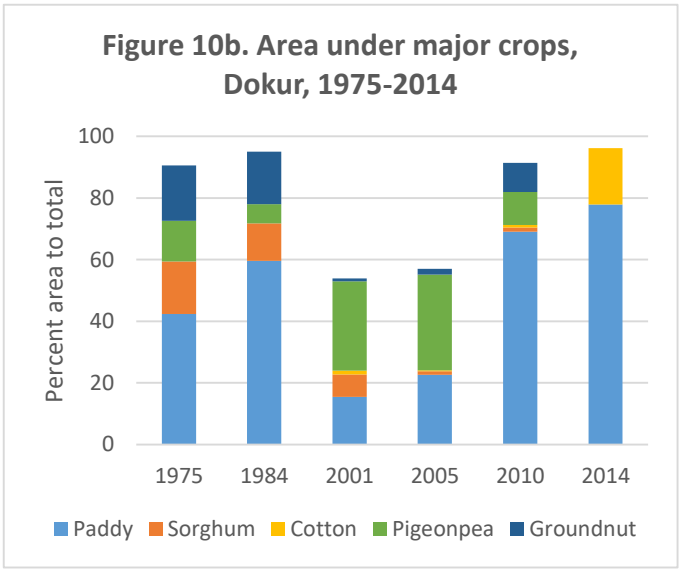


Figure 10b. Area under major crops, Dokur, 1975-2014
Percent area to total
100
80
60
40
20
0
1975 1984 2001 2005 2010 2014
Paddy Sorghum Cotton Pigeonpea Groundnut

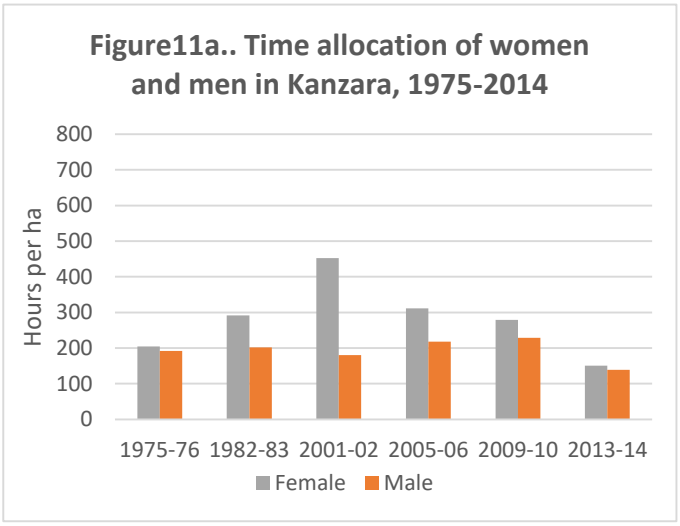


Figure11a.. Time allocation of women and men in Kanzara, 1975-2014
Hours per ha
800
700
600
500
400
300
200
100
0
1975-76
1982-83
2001-02
2005-06
2009-10
2013-14
Female
Male

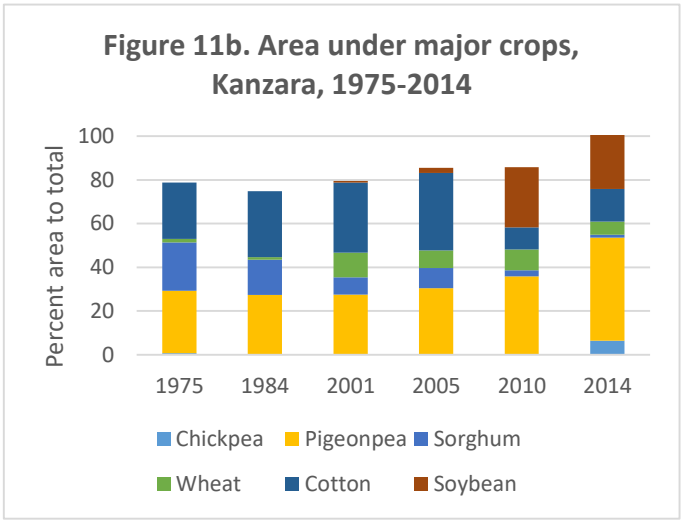


Figure 11b. Area under major crops, Kanzara, 1975-2014
Percent area to total
100
80
60
40
20
0
1975
1984
2001
2005
2010
2014
Chickpea
Pigeonpea
Sorghum
Wheat
Cotton
Soybean

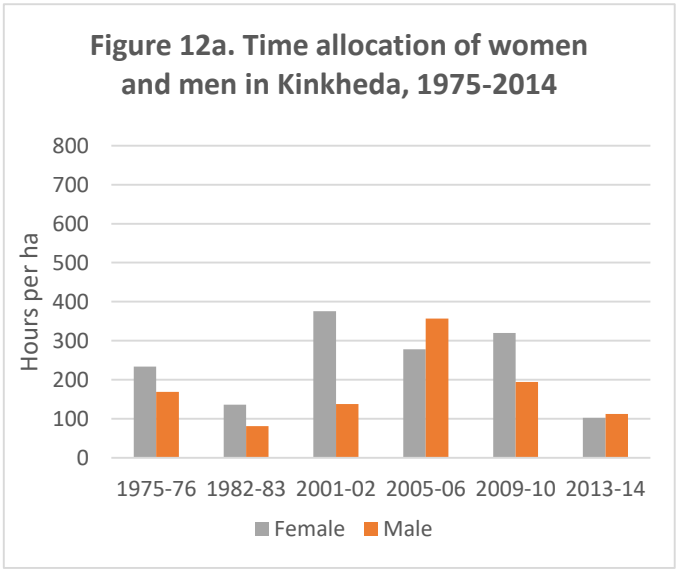


Figure 12a. Time allocation of women and men in Kinkheda, 1975-2014
Hours per ha
800
700
600
500
400
300
200
100
0
1975-76
1982-83
2001-02
2005-06
2009-10
2013-14
Female
Male

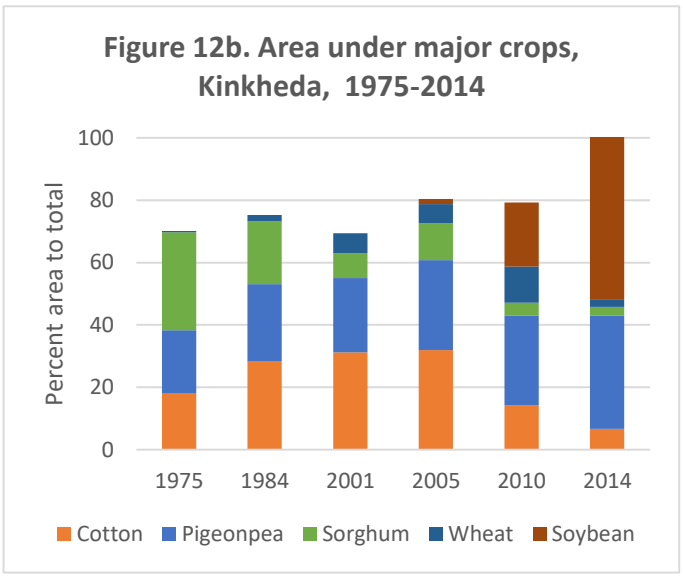


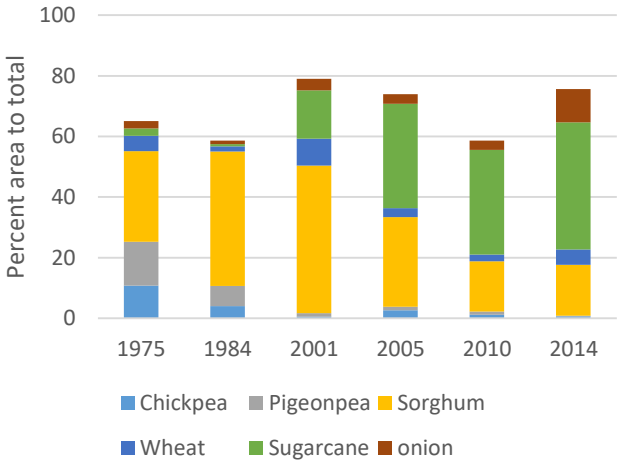
Figure 12b. Area under major crops, Kinkheda, 1975-2014
Percent area to total
100
80
60
40
20
0
1975
1984
2001
2005
2010
2014
Cotton
Pigeonpea
Sorghum
Wheat
Soybean

Figure 13a. Time allocation of women and men in Kalman, 1975-2014

Figure 13b. Area under major crops, Kalman, 1975-2014

Figure 14a. Time allocation of women and men in Shirapur, 1975-2014

Figure 14b. Area under major crops, Shirapur, 1975-2014



4.3. Operation wise participation in agriculture – by gender and type of labor

ICRISAT Village Level Surveys are one of the few surveys which have time-use data by agricultural operation, by gender over time. An examination of the operation wise participation of women and men in agriculture reveals that involvement of women has increased over time not only in terms of number of hours per hectare but also in the number of operations. In the early years (1975-76) women were involved mostly in sowing, weeding and harvesting operations but gradually over time, their role in land preparation, irrigation, plant protection and post-harvest processing also became evident and there is an increase in the time burden of women (Figure 15). Men on the other hand continue to perform the same operations over time and there is in fact a fluctuation in terms of time use by men, which is declining. Even though the participation of women has increased in more number of activities, the overall labor burden of rural women is in three major operation – sowing operation; weeding and related operations and harvesting while that of men is mostly in land preparation and related operations and irrigation. Harvesting is also an activity that men are involved and spend about 41-60 hours per hectare (Figures 16a and 16b; data in circle is the total number of hours per ha for all operations put together). As can be seen from these two figures, women spend around 75-94% of their time on these three operations – sowing, weeding and harvesting - whereas men spend about 55-80 % of their time on the three most important operations – land preparation, irrigation and harvesting.

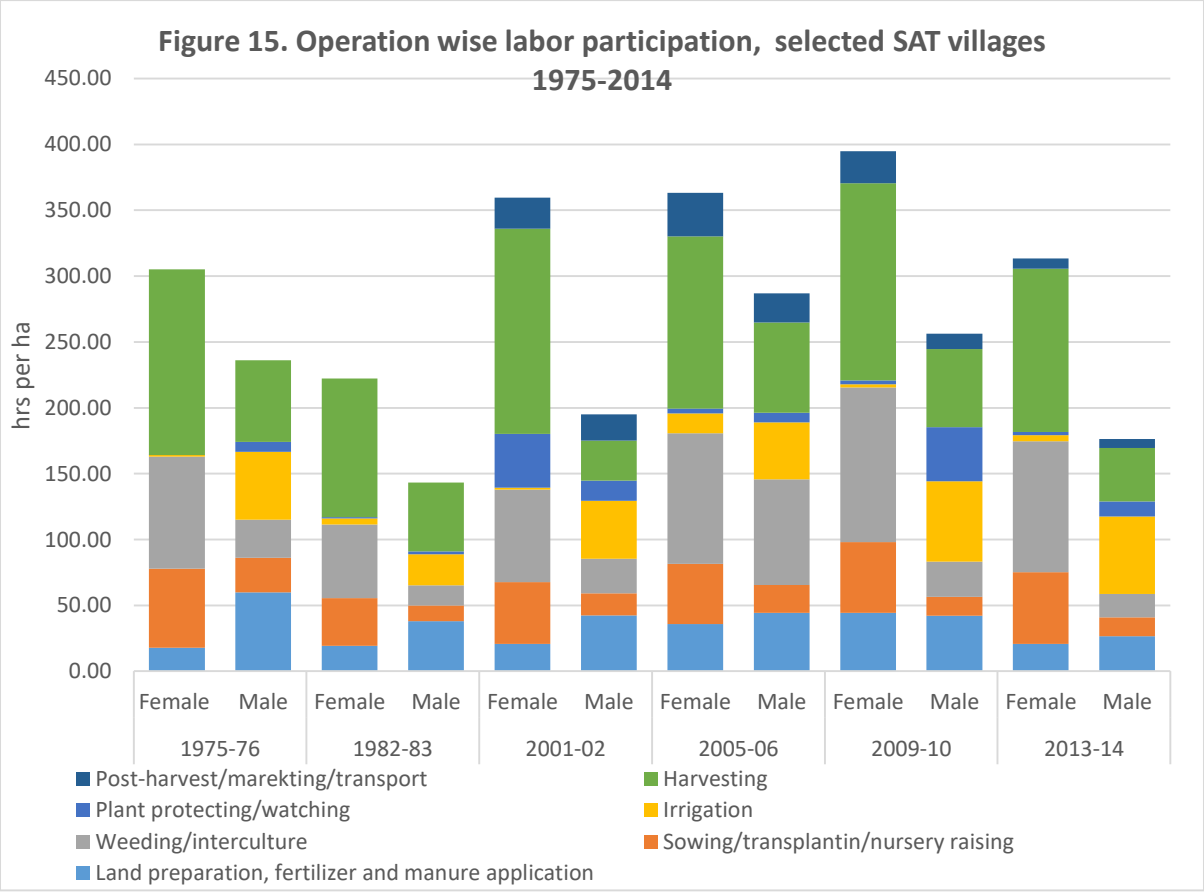
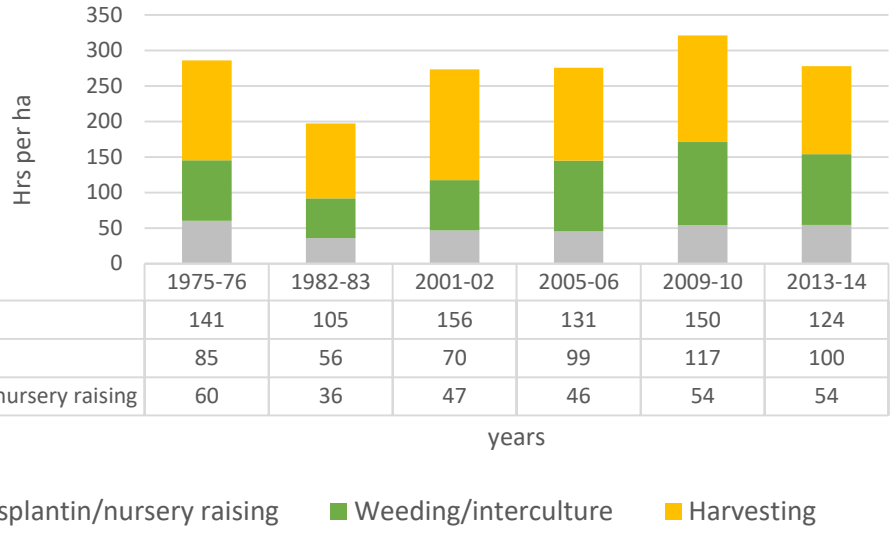
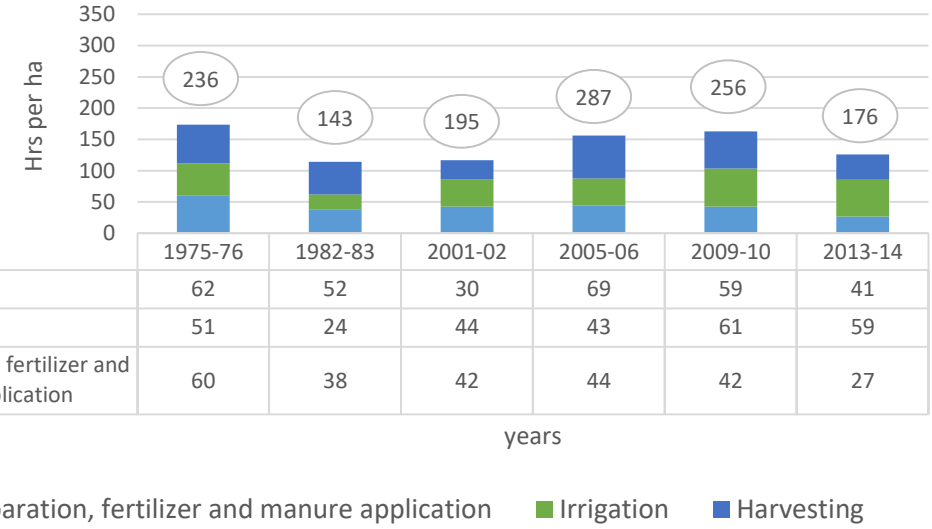


Figure 16a. Agricultural operations performed by women, SAT villages, 1975-2014



	1975-76	1982-83	2001-02	2005-06	2009-10	2013-14
Harvesting	141	105	156	131	150	124
Weeding/interculture	85	56	70	99	117	100
Sowing/transplantin/nursery raising	60	36	47	46	54	54

Figure 16b. Agricultural operations performed by men, SAT villages, 1975-2014



	1975-76	1982-83	2001-02	2005-06	2009-10	2013-14
Harvesting	62	52	30	69	59	41
Irrigation	51	24	44	43	61	59
Land preparation, fertilizer and manure application	60	38	42	44	42	27

Continuing the examination of the labor participation in agriculture by analysing the type of labor – family and paid/hired labor presents an interesting story. In Aurepalle village, Mahbubnagar district there is an increase in female labor – both family female (FF) and hired female (HF) from 1975 to 2014. However the time by men – both family male (FM) and hired male (HM) is declining over the years, more so in the case of HM labor which has reduced drastically (figure 17a). The cropping pattern changed from castor which was the dominant crop and is less labor intensive to Bt-cotton which is now the dominant crop and is labor intensive. This shift came about starting 2005 and this

explains the increasing role of women in agriculture. The village has seen a good implementation of the Employment program by the Government – Mahatma Gandhi National Rural Employment Guarantee Act (MGNREGA). The rising wages in agriculture especially the male wages and the wage parity due to MGNREGA, this village is witnessing the deployment of family female labor into agriculture especially during the peak time of labor need – sowing, weeding and harvesting of cotton. Women are spending about 150-260 hours per hectare on their own farms, which has a burden on their time, which was earlier spent on domestic activities and family care. Their involvement in agriculture operations (against activities performed at home) also implies additional energy expenditure and this has a negative effect on their nutritional status.

The situation in Dokur is the opposite in terms of cropping pattern. Dokur has shifted from a labor intensive crop (Paddy) to castor which requires less labor. The shift is because of continuous drought experiences year after year and lack of irrigation facilitates. The continuous drought has also resulted in migration of men and women to nearby towns for about 10 months in a year. As can be seen from figure 17b, there is a decrease in the hired female use compared to 1975 but is still significant (close to 500 hours per hectare). Hired male labor use is on the decline. With regard to family labor – there is no major change in the family female labor use but there is a decline in the family male labor in agriculture. Married couples in the child bearing age (18-49 years) are migrating to the towns, leaving behind children, adolescents boys and girls, unmarried youth and the elderly in the village to perform agricultural tasks. Those left in the village prefer to work for MGNREGA activities as the wages are higher compared to agriculture wages. Hence there is seen a reduction in labor use especially male labor, both family and hired, and hiring of female labor as a substitute for the male labor which is becoming more expensive.

A similar analysis based on the data for the two villages in the assured rainfall region where the pathway of development is through intensification of agriculture (figure 18a and 18b) highlights an additional dimension. In these two villages overall there is a decrease in labor use in agriculture for all types of labor – family and hired – male and female even though there is intensification of agriculture. The cropping pattern in these villages has shifted from a labor intensive, long duration crop (cotton, which has been grown for centuries) to soybean which is less labor intensive and fits well in the cropping patter for farmers to go in for a second crop in the post-rainy season. What is interesting to note here is that these two villages are mechanizing agriculture to meet the demands for the agriculture operations. However mechanization has benefitted the male labor mostly and the demand for female labor –hired continues to be high even though there is a sharp decline. Family female labor use is also on the decline. Mechanization can be seen to displace female labor from employment in agriculture.

The analysis of the data from the two villages of Solapur district illustrate another dimension – the availability of irrigation for agriculture and its impact on labor use. Figures 19a and 19b tell a story of increase in both family and hired female labor use in agriculture operations. Family male labor use is also increasing over the years but there is a decline in hiring male labor. These villages also have seen an increase in mechanization and also a shift from labor intensive crops to crops requiring less labor.

Summarizing, the time use analysis based on a 24-hour recall and participation in agriculture operations and activities add deeper insights into the heterogeneity in women's contribution in agriculture (Sofa team and Doss C, 2011). The sociological and descriptive analysis clearly bring out the fact that female time-use in agriculture varies by crop, production cycle, mechanization, wealth status and social group. The findings corroborate the earlier findings by different authors that sowing, weeding and harvesting are predominantly female activities and women contribute more than 75% of their time and labor for these activities. In total, at an aggregate level, the labour burden of rural women exceeds that of men, and includes a significant proportion of family labor who have other household responsibilities related to preparing food, caring for the children and elderly and collecting fuel and water.

Figure 17a. Labor use by operation and type of labor, Aurepalle village, Mahbubnagar district, 1975-2014

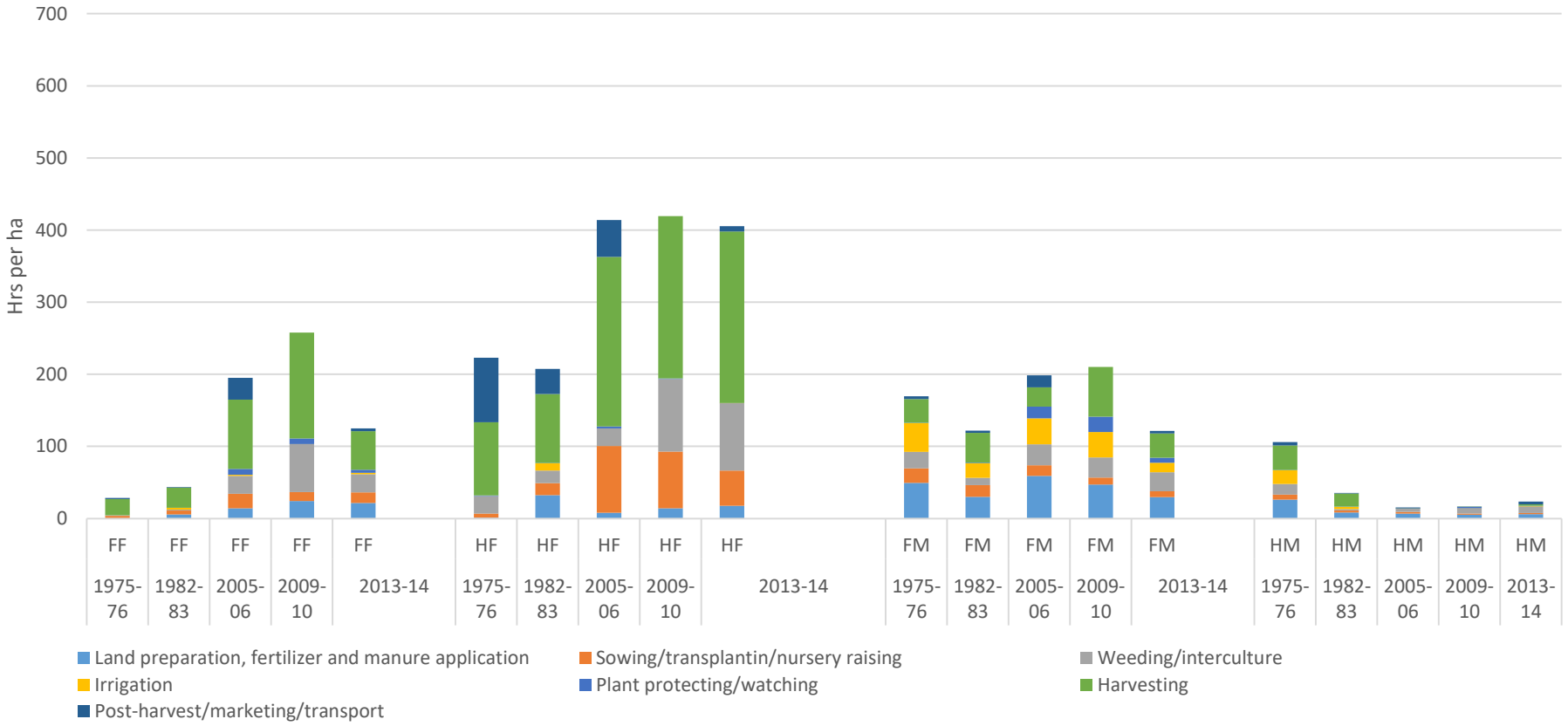


Figure 17b. Labor use by operation and type of labor, Dokur village, Mahbubnagar district, 1975-2014

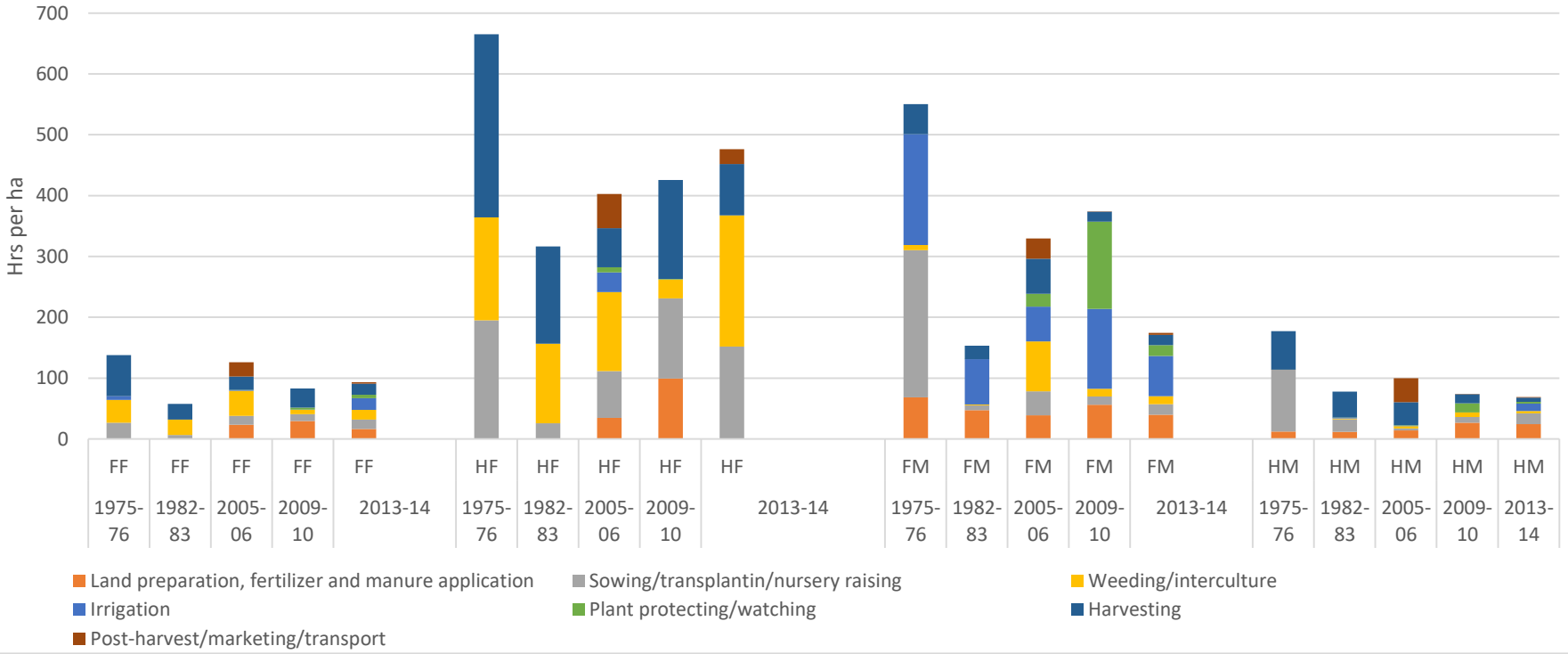
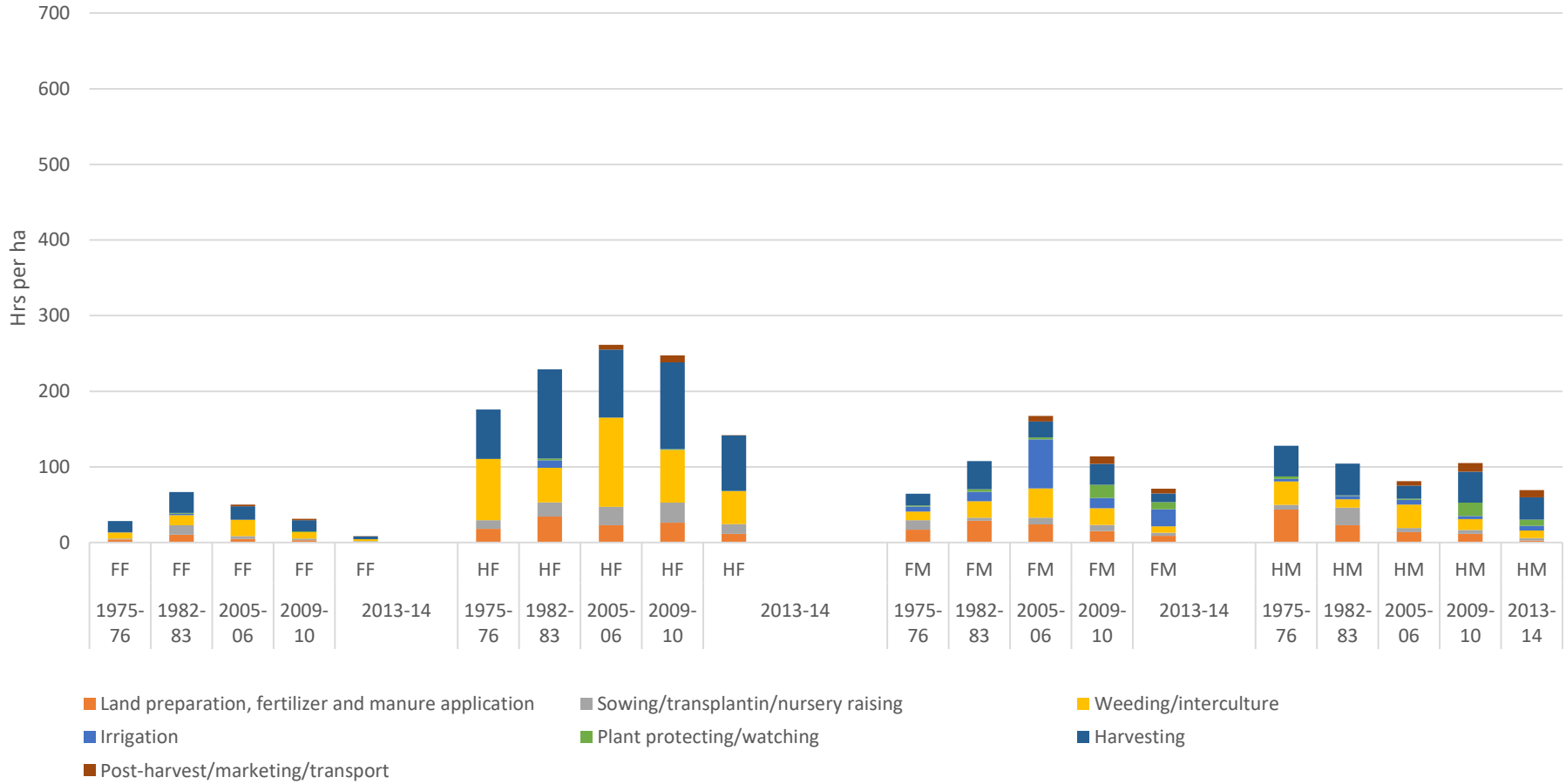


Figure 18a. Labor use by operation and type of labor, Kanzara village, Akola district, 1975-2014



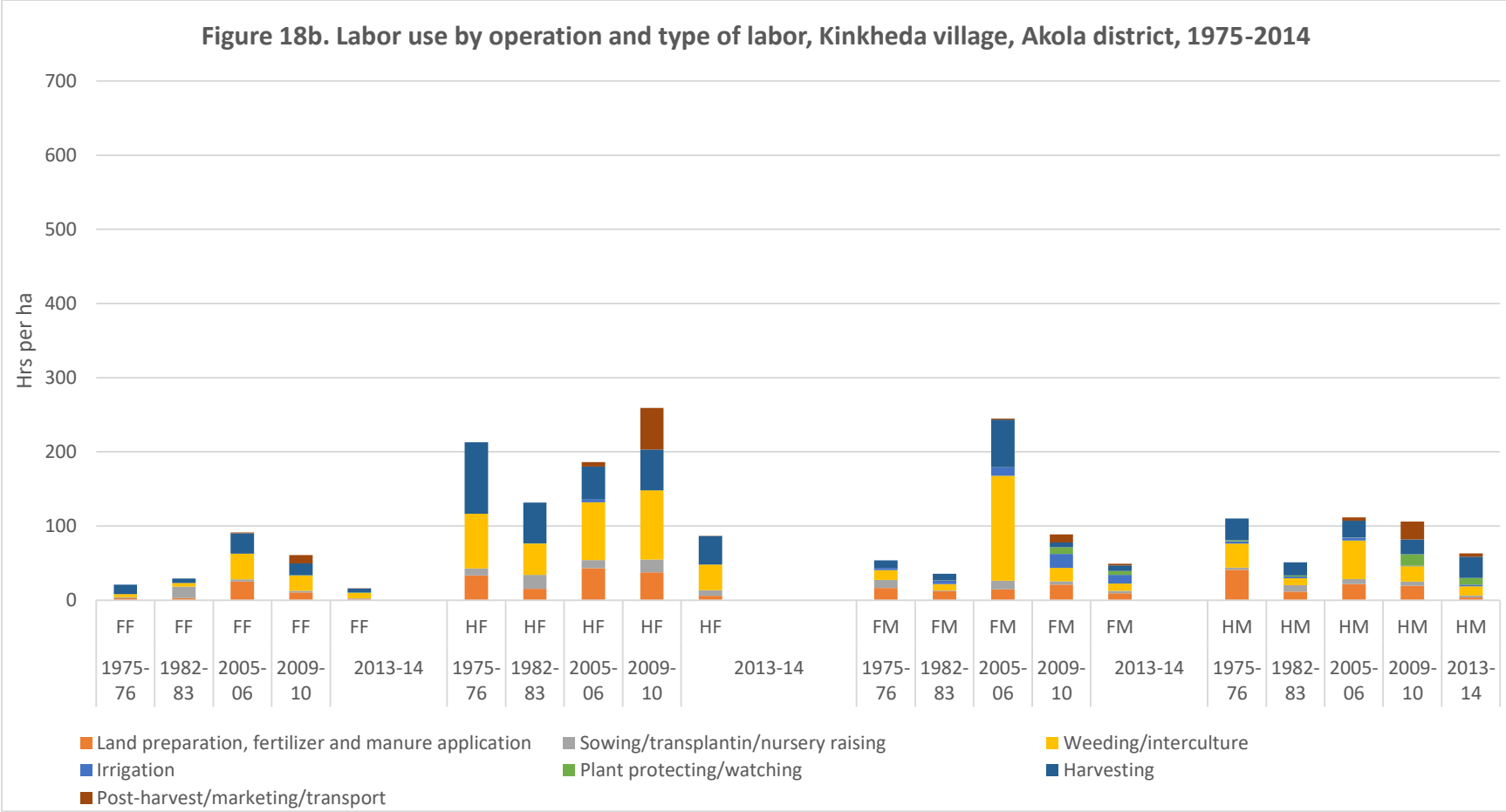
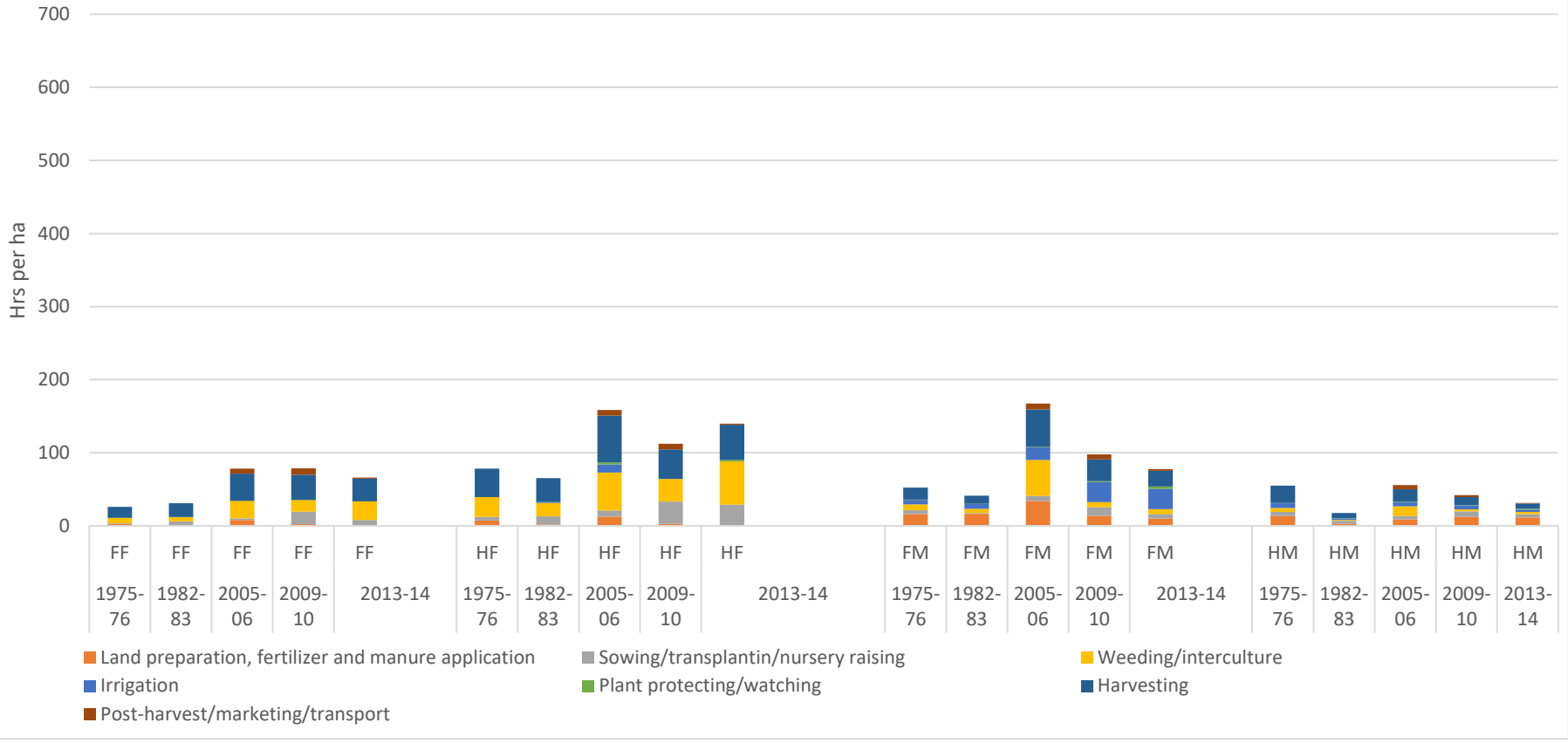


Figure 18b. Labor use by operation and type of labor, Kinkheda village, Akola district, 1975-2014
Hrs per ha
700
600
500
400
300
200
100
0
FF 1975-76
FF 1982-83
FF 2005-06
FF 2009-10
FF 2013-14
HF 1975-76
HF 1982-83
HF 2005-06
HF 2009-10
HF 2013-14
FM 1975-76
FM 1982-83
FM 2005-06
FM 2009-10
FM 2013-14
HM 1975-76
HM 1982-83
HM 2005-06
HM 2009-10
HM 2013-14
Land preparation, fertilizer and manure application
Sowing/transplantin/nursery raising
Weeding/interculture
Irrigation
Plant protecting/watching
Harvesting
Post-harvest/marketing/transport

Figure 19a. Labor use by operation and type of labor, Kalman village, Solapur district, 1975-2014



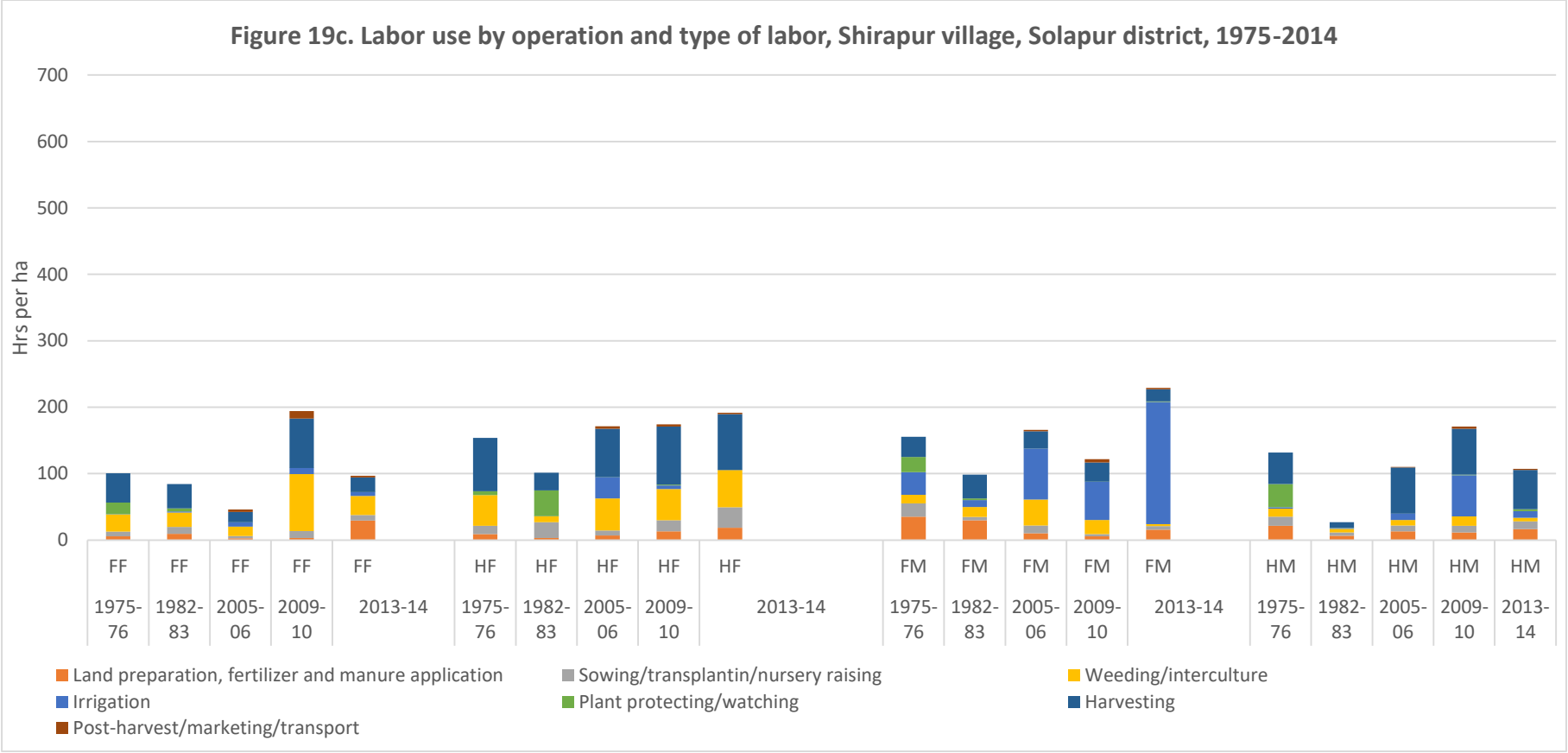
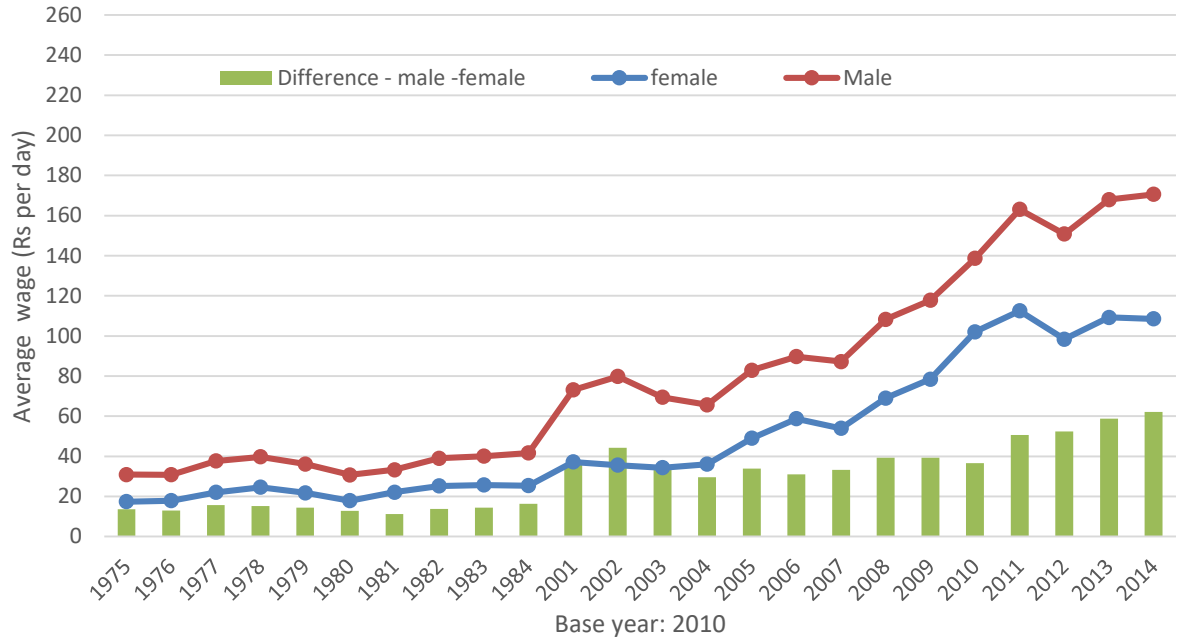


Figure 19c. Labor use by operation and type of labor, Shirapur village, Solapur district, 1975-2014
Hrs per ha
700
600
500
400
300
200
100
0
FF 1975-76
FF 1982-83
FF 2005-06
FF 2009-10
FF 2013-14
HF 1975-76
HF 1982-83
HF 2005-06
HF 2009-10
HF 2013-14
FM 1975-76
FM 1982-83
FM 2005-06
FM 2009-10
FM 2013-14
HM 1975-76
HM 1982-83
HM 2005-06
HM 2009-10
HM 2013-14
Land preparation, fertilizer and manure application
Sowing/transplantin/nursery raising
Weeding/interculture
Irrigation
Plant protecting/watching
Harvesting
Post-harvest/marketing/transport

4.4. Wage rates – by gender

The rural real wages (base year = 2010) for agricultural work show a rising trend since 1975 -2014 for all the six villages put together. This trend is similar for both male wages and female wages (Figure 20). In real terms female wages grew at a faster rate compared to male wages. Male wages grew from Rs 30 per day in 1975 to close to Rs 170 per day by 2014-15. The increase is almost four folds. Similarly, real wages for female labor in agriculture grew from about Rs 17 in 1975 to Rs 107 per day in 2014-15, which is increase by six times from 1975. However as can be seen from the figure, the inequality between male and female wages has also increased and the gap between them is widening. The difference in the male and female wages (in real terms) was more or less similar during the period 1975-1984. However starting 2001, this difference continues to increase and by 2014 the difference in average male and female wage is Rs 62 per day.

Figure 20. Trends in male and female real wages in agriculture, SAT villages, 1975-2014



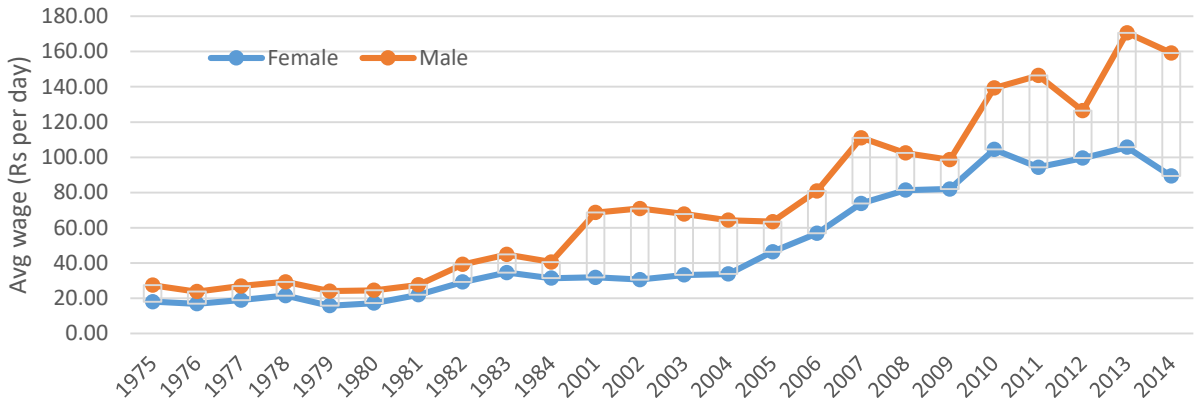
A further analysis of the wage trends by region/villages is presented below and interesting insight emerge from this analysis.

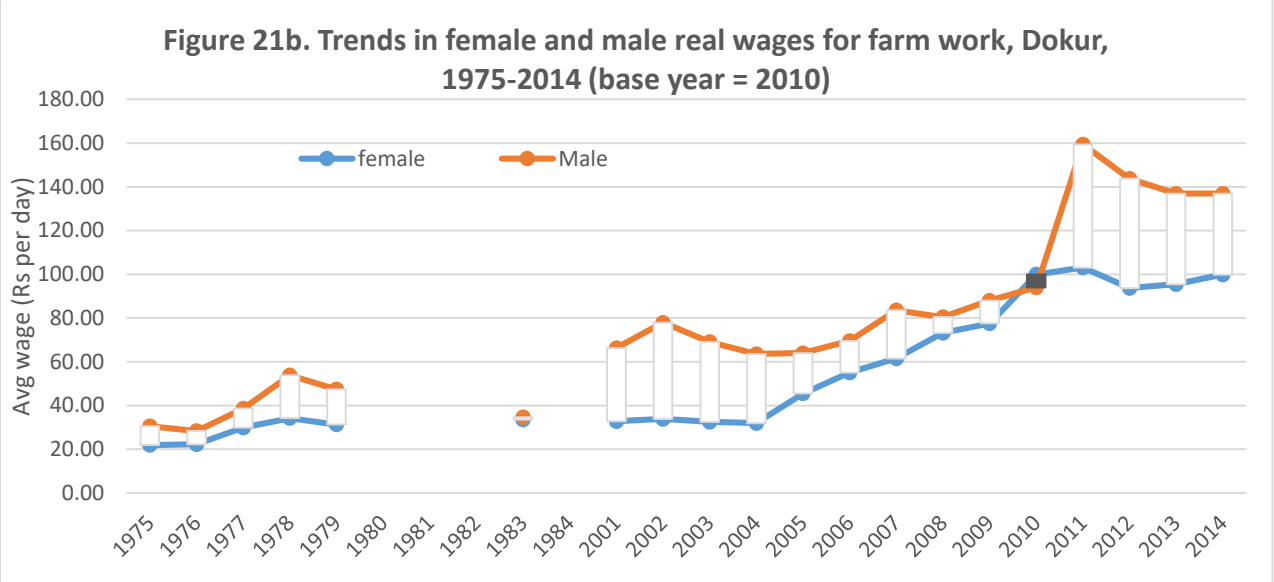
As can be seen from figures 21a and 21b which correspond to the two villages in Mahabubnagar region, the inequality in wages between male and female started from 2001 and is continuing. In Aurepalle village, the gap widened between 2001-03 but then 2004 and 05 saw a narrowing of the gap. The increase in the male wages at a faster pace compared to the female wages is one reason why Aurepalle saw an introduction of cotton into the farming system which was earlier dominated by cereals and subsistence crops, which required more male labor. Cotton cultivation uses more female labor but he wages for female was not increasing at the same pace as male wages (male wages tripled in 2001 compared to 1975 whereas female wages only doubled that period). 2005 was a bad year in terms of rainfall and the area under crops in general dropped by 40 percent. This also meant that the wages reduced both for male and female labor. During the period 2006 to 2014, cropping intensity increased and wages for both male and female labor increased. Male labor was being substituted by female labor and this can be seen even from the time allocation graphs (figure 11a and 11b).

Dokur (figure 21b) on the other hand witnessed a trend whereby the wages for both male and female labor were almost equal (2009, 2010). This was a period when paddy cultivation was also increasing and both labor showed putting in equal hours per hectare in agriculture. Post 2010, the wage inequality increased and hence more women were employed in agriculture or working on their own farms to meet the labor requirements for crop cultivation especially paddy cultivation. Male migration was at its peak during the years 2006-2008, reduced in 2009 because of good rains with a promise of agriculture as a viable livelihood option, but again started rising from 2011 onwards. Female labor use in agriculture increased during these periods and female labor was substituted for male labor because of the rising male wages.

To be done: Include wages by operation

Figure 21a. Trends in female and male real wages for farm work, Aurepalle, 1975-2014 (base year = 2010)





The analysis from the assured rainfall regions of Akola represented by villages Kanzara and Kinkheda (Figures 21c and 21d) presents a picture of an increasing wage trend for both male and female labor in agriculture from 2001 onwards (exception: year 2007). In Kanzara, both the male and female wages increased by 4.5 times in 2014 compared to year 1975. However the inequality between the male and female is wage sthe highest in these two villages. A look at the major crops cultivated in this village revelas that from 1975 to about 2001 pigeonpea, cotton and sorghum were the three crops that made up for 70% of the cropped area. These three crops require both male and female labor for their cultivation and this is reflected in the time allocation patterns (figure). However starting 2001 the area under sorghum decreased, area under cotton increased and wheat was being also cultivate in more area. Cotton requires more female labor, and wheat operations were mechanized, thus male wages increased, Women wages also increased and more women were being hired for cotton cultivation. Starting 2007-08, soybean was introduced into the cropping system – a. it is totally mechanized; b. fits well into the rainy season cropping period, hence farmers can go in for other crops in post rainy season; ; and c. government subsidy on seeds and d. cotton prices were fluctuating. Again from the period 2008 onwards male and female labor were equally employed in agriculture – male labor for soybean crop (mechanized) and female labor for pigeonpea, cotton, chickpea and wheat. Thus the wages increased for female labor at a higher pace from 2001 to 2007 and then at a slower pace from 2008 onwards. Similar trend was observed with the wages for male labor also. However the gap between the male wage and female wage increased . For eg, the wages for female labor increased by only Rs 3.40 from 2012 to 2013, whereas the wages for men increased by Rs 18.52 for the same years (2012 to 2013). The increase in the male wage was due to mechanization ie skilled male labor who could operate the tractor or thresher or harvestor were needed and they fetched higher wages. Village Kinkheda also has a similar story with wheat and soybean replacing cotton and sorghum. The Akola villages present a case of greates inquality in the wages between male and female due to the cropping pattern and nature of operations to be performed ie skilled male labor and women who could pick cotton and harvest pigeonpea

Figure 21c. Trends in female and male real wages for farm work, Kanzara, 1975-2014 (base year = 2010)

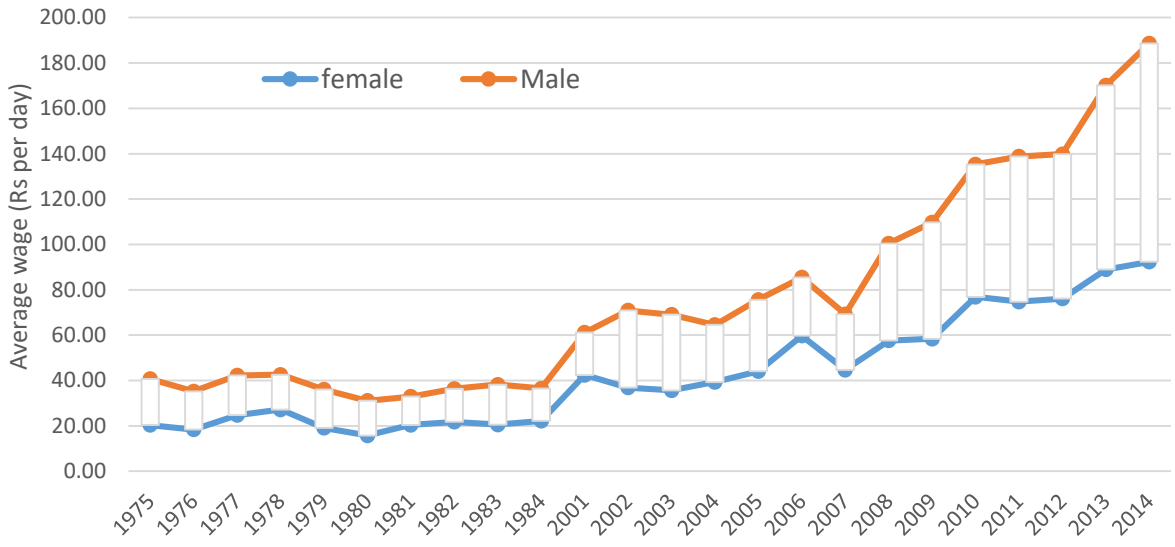
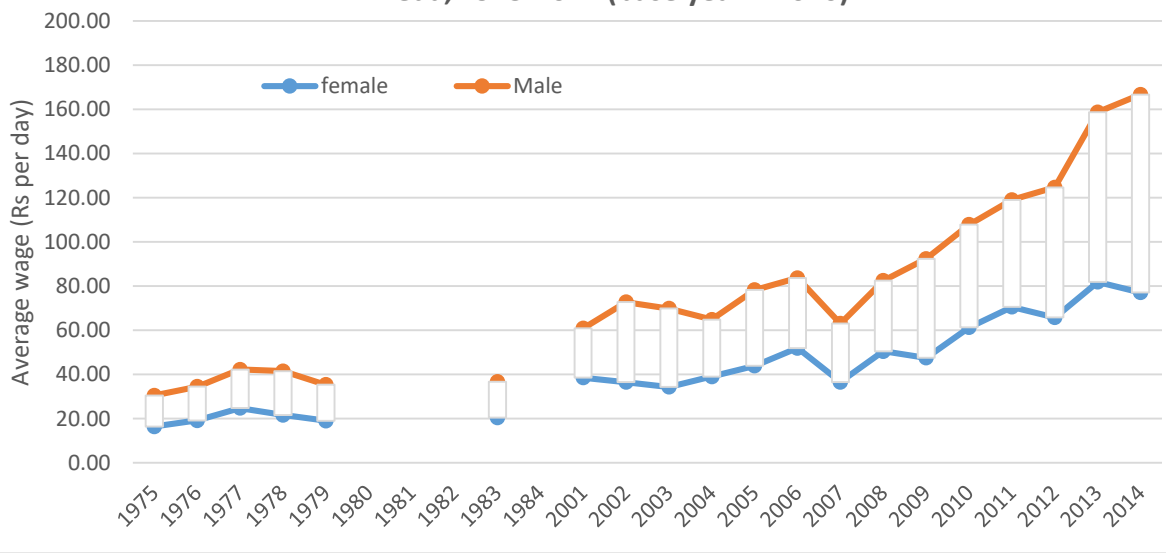


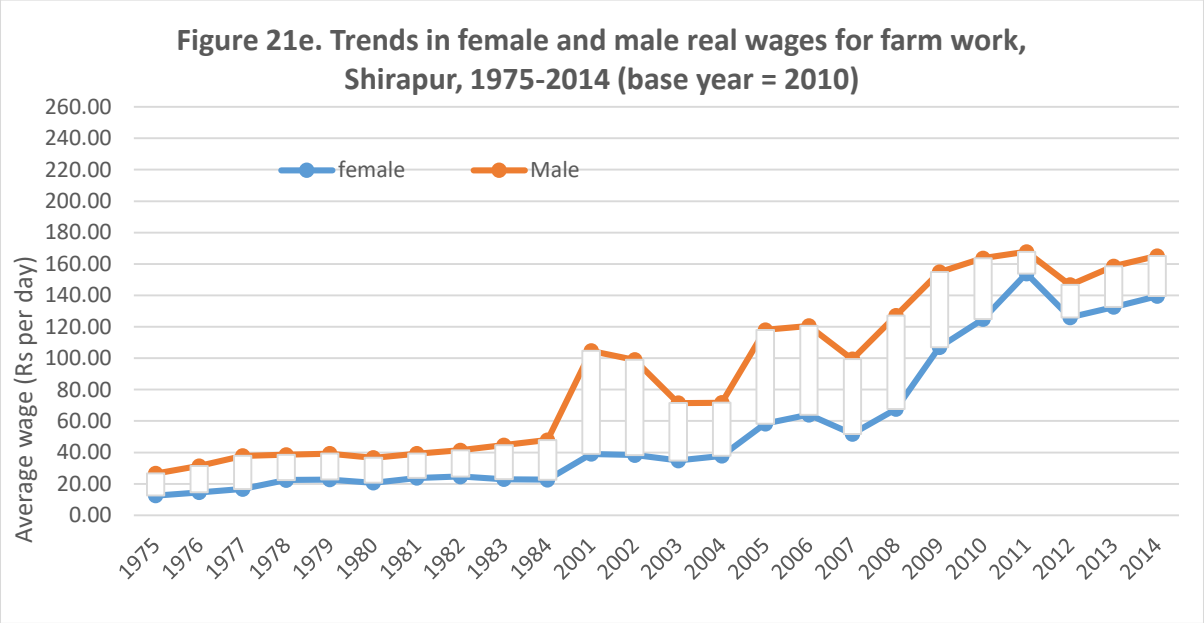
Figure 21d. Trends in female and male real wages for farm work, Kinkheda, 1975-2014 (base year = 2010)

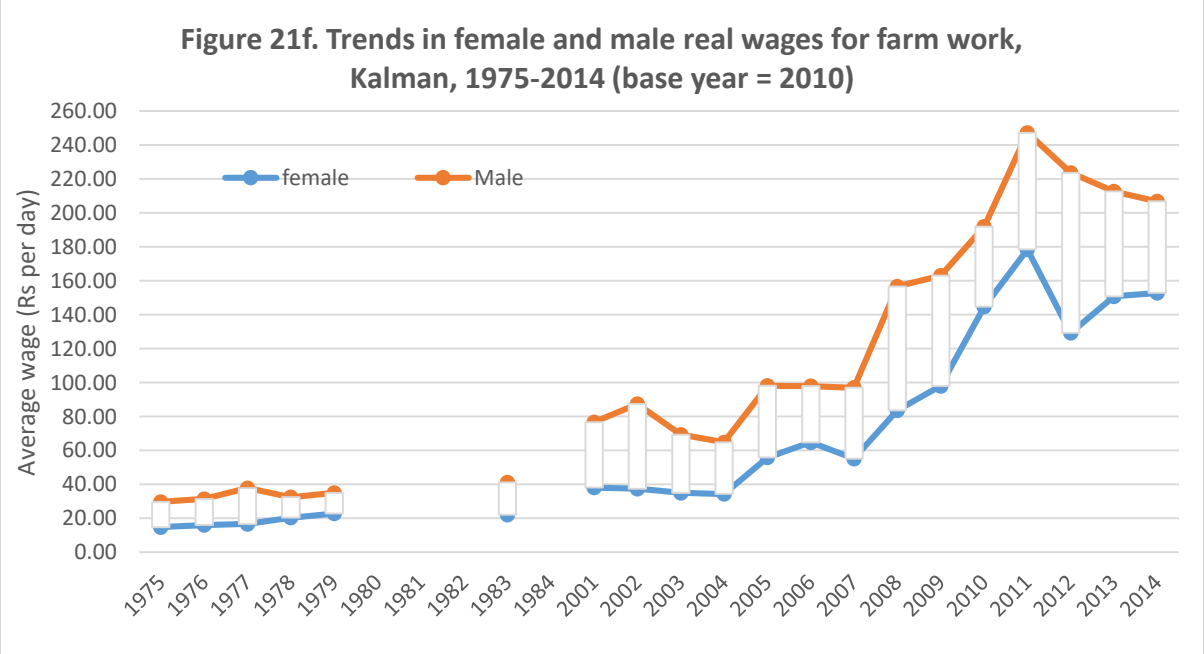


The Solapur villages, which are also in the unassured rainfall region but have access to canal irrigation (figures 21e and 21f) present a very different story. Shirapur which has a dominance of sorghum till 2001 and then sugarcane coming into the farming system since 2001. These two crops account for more than 50% of the area under cultivation. And hence Shirapur village illustrates equal participation of men and women in agriculture. The wage rates for female labor increased by about 11 times from 1975 to 2014 (from Rs 12.52 in 1975 to Rs 139.56 in 2014) while male wages increased only about 6 times from 1975 to 2014. The wage gape between male and female wages is also reduced from 2001 to 2014 and the difference in the wages is almost like it was during the

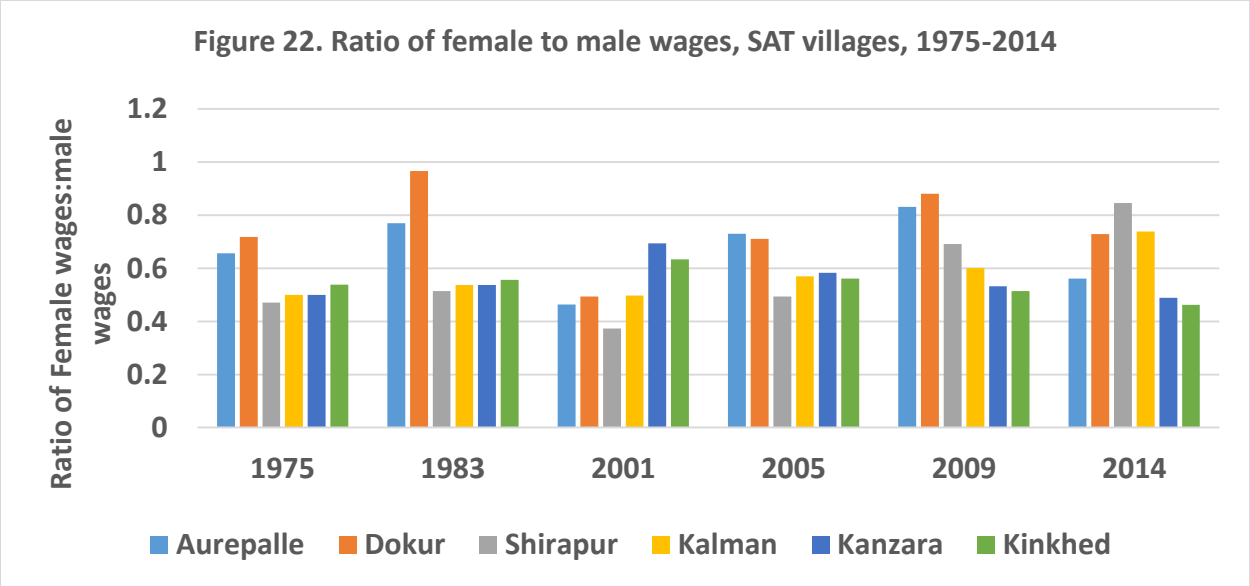
period 1975-1984. Shirapur is an example of male labor being substituted for female labor for sugarcane crop as the wage rates for both male and female are almost same or similar.

The story of Kalman is also similar to Shirapur in terms of the increase in female and male wages. Kalman is diversifying into high value commodities like vegetables and fruits (grapes) and sorghum is the main food crop. High value crops are grown in small land areas. Kalman also showcses equal participation of men and women in agriculture work.





A concluding note on the wage story. The ratio of female to male wages has never reached 1 even though Dokur was almost close to achieving wage parity during the period 1983-84. This was the period when Dokur showed a promise in agriculture with water bein available from the tanks for paddy cultivation. In the subsequent years, Dokur has witnessed continuous droughts and hence the wage parity also decreased with male members migrating out to towns for livelihood options and female members of the community left behind in charge of agriculture. The situation seemed to improve in 2009 with good rains but again the trend of insufficient rains haunts Dokur.



4.5. Mechanization

There has been a sustained increase in the adoption of mechanization for greater return on investments and enhancing profitability of agriculture, to meet the labor shortages during peak periods of the agricultural season and sustainability of agriculture. Mechanization is primarily driven by increased use of tractors, which is replacing manual and animal labour. The general pattern of mechanization trends observed in India in general and in the semi-arid tropics is:

a. Farm operations requiring high power inputs and low control are mechanized first (tillage, transport, water pumping, milling, threshing, etc.)
b. Farm operations requiring medium levels of power and control are mechanized next (seeding, spraying, intercultural operations, etc.).
c. Farm operations requiring high degree of control and low power inputs are mechanized last (transplanting, planting of vegetables, harvesting of fruits and vegetables, etc.).

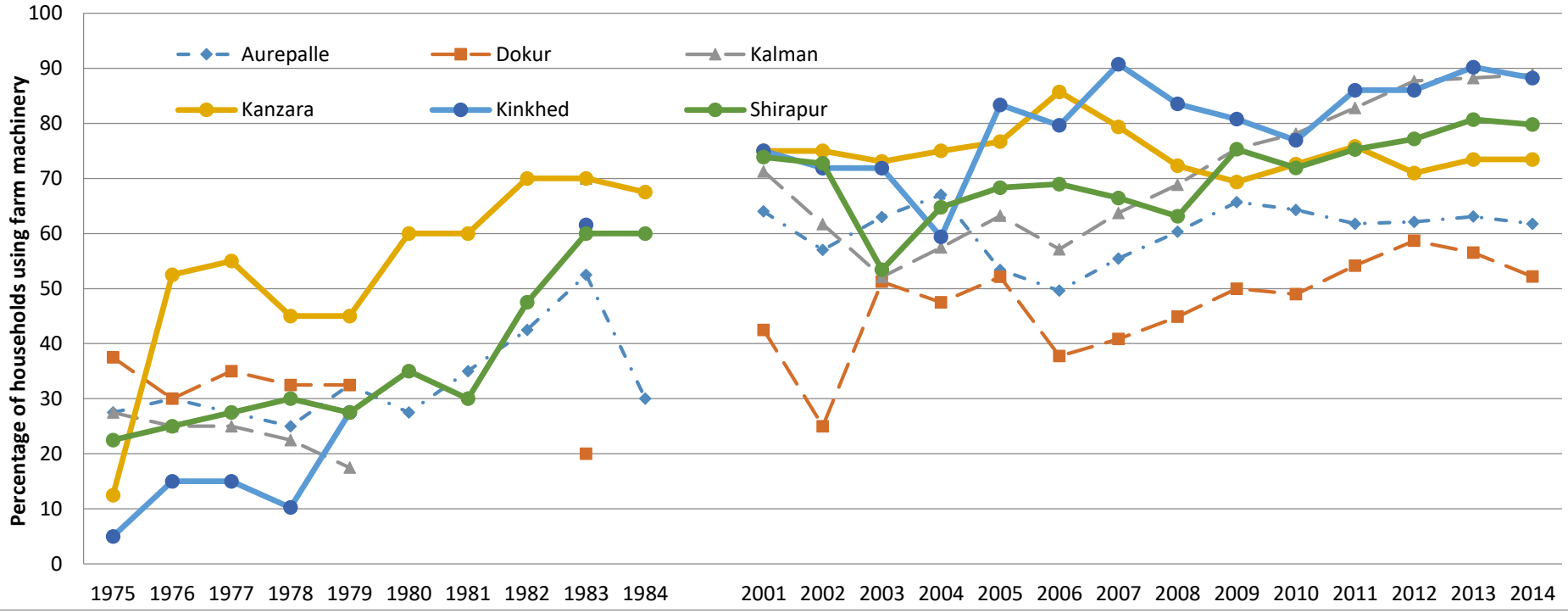
In agriculture, it is argued that the process of mechanization of agricultural activities leads to gender discrimination and class polarization by replacing men for a number of activities performed by women and also by displacing the labour of women from subsistence and marginal households. The VDSA and the VLS data provides evidence that more women are employed when there is absolute shortage of labour (especially due to male migration), higher wages for male labor and for specific operations like cotton picking. The unpaid family labour days increase for women with the adoption technology. This pattern is consistent with the twin proportion that (1) women are called upon to

do field crop operation as the alternative to hiring in labour, whenever there is not sufficient male labour to satisfy total requirements and (2) on bigger farms more effective use can be made of female labour in particular operations for which they are thought to be specifically suited. Where women do take up large labour their wages are barely above the subsistence level.

Table XX. Trends in machinery use (hours per hectare), 1975-2014																								
Village	**1975**	**1976**	**1977**	**1978**	**1979**	**1980**	**1981**	**1982**	**1983**	**1984**	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**	**2013**	**2014**
Thresher																								
Aurepalle							1.98				2.33	2.79	2.29	2.67		1.98	2.97	2.08	1.65	3.26		1.18	8.09	1.80
Dokur											1.32	1.64	2.39	1.74	2.28	2.87	2.69	0.51	1.53	2.09	2.16	2.55	0.43	1.95
Kanzara		3.17	3.50	3.81	4.97	6.46	5.76	5.92	6.43	6.65	4.05	3.73	1.91	3.39	4.18	4.55	7.90	7.99	9.83	14.48	9.55	8.80	6.91	6.81
Kinkhed	11.47		4.53		4.58				3.82		2.52	2.43	1.75	1.43	3.74	3.30	5.81	7.86	8.71	13.33	8.65	7.15	3.35	5.19
Shirapur			41.18	50.66	35.21	5.20	4.12	1.75	2.77	0.93	2.60	2.29	0.79	3.09	3.32	2.80	6.19	7.11	4.71	7.35	6.86	6.12	5.53	5.05
Kalman				40.45	9.25				1.90		1.89	0.89	0.70	1.10	1.55	2.50	2.11	2.42	2.24	2.20	2.00	0.89	1.08	1.78
Tractor																								
Village	**1975**	**1976**	**1977**	**1978**	**1979**	**1980**	**1981**	**1982**	**1983**	**1984**	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**	**2013**	**2014**
Aurepalle						13.73	17.68	2.34	2.47		5.44	4.36	3.70	6.31	4.81	7.91	10.08	10.26	9.41	15.05	15.14	14.75	16.56	13.79
Dokur				3.59	10.55				2.47		5.91	4.68	5.34	4.55	7.74	9.69	9.27	12.70	14.44	12.74	18.47	15.98	26.55	24.61
Kalman											7.34	5.21	3.32	2.90	6.84	6.92	4.49	7.82	5.52	7.71	7.67	13.45	10.96	13.42
Kanzara					4.30	6.17	3.50	1.43	8.70	2.63	6.57	7.35	6.67	6.59	11.78	11.02	13.45	13.42	11.67	15.01	15.11	17.91	16.44	13.06
Kinkhed		4.98	5.65	4.23	4.65				0.98		4.47	4.89	4.08	5.07	7.10	9.87	10.06	7.99	7.91	11.20	14.94	14.58	10.79	12.33
Shirapur						4.94	7.06				6.68	10.98	3.68	8.38	10.80	31.86	7.10	10.24	7.91	19.29	27.31	23.48	29.60	17.53
Sprayer																								
Village	**1975**	**1976**	**1977**	**1978**	**1979**	**1980**	**1981**	**1982**	**1983**	**1984**	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**	**2013**	**2014**
Aurepalle	10.03				1.88		5.62	6.42	6.02	7.84	109.04	27.81	67.91	34.93	63.22	43.26	41.10	22.24	36.56	47.86	21.01	23.47	15.34	7.71
Dokur					7.14						11.82	6.99	13.17	35.71	4.30	3.38	7.30	6.50	4.10	4.53	8.07	5.20	6.90	6.28
Kalman											93.18	124.71	46.57	67.37	158.71	143.54	242.62	124.80	63.95	87.09	29.33	64.36	30.78	43.92
Kalman																19.77								
Kanzara						29.60					76.7	66.4	30.7	14.7	38.8	36.4	40.1	39.1	71.0	106.9	55.4	34.6	25.2	28.4
Kanzara															14.83									
Kinkhed				9.88							96.19	203.05	458.87	29.78	285.49	289.51	277.89	199.27	198.37	227.41	193.98	181.86	236.26	314.17
Shirapur							5.77				15.30	14.05	3.83	82.37	40.33	17.30	27.64	46.25	35.81	36.12	37.92	40.50	33.58	22.40

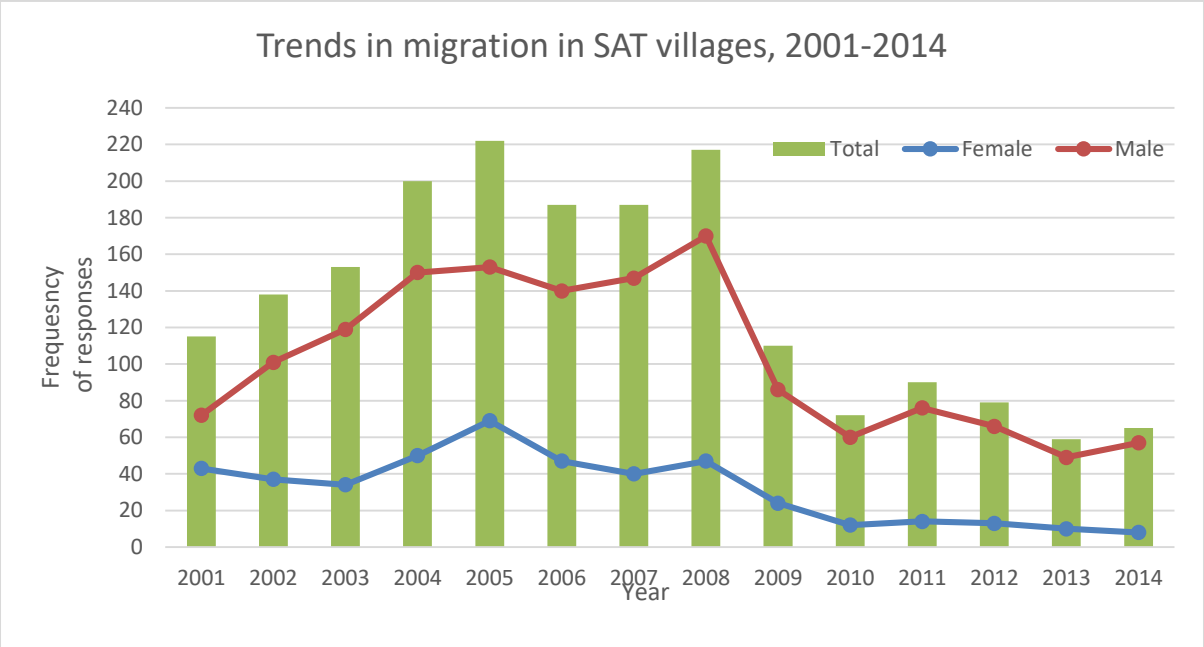
Harvester																								
Village	**1975**	**1976**	**1977**	**1978**	**1979**	**1980**	**1981**	**1982**	**1983**	**1984**	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**	**2013**	**2014**
Aurepalle																		4.94	1.70	2.86	1.98			1.98
Dokur																2.94	2.87	3.55	4.46	3.56	4.04	4.20	5.52	5.13
Kalman																	10.30							1.24
Kanzara															4.94	2.06	4.45	1.34	2.77	3.42	2.95	2.59	2.31	1.84
Kinkhed																1.43	3.82	1.90	2.89	3.18	3.02	2.17	2.13	1.20

Figure XX1. Farm machinery use in households, 1975-2014, semi-arid tropics , India



4.6. Migration

Labor out-migration was not an issue in the SAT during the period 1975 to 84 and hence there is no data available in the VLS/VDSA on migration during these years. Starting 2001, when the studies were resumed, sweeping changes were taking place in the external environment (like globalization), there was climate variability and water scarcity being observed in the SAT villages and changes in the cropping patterns and other investments in human capital, policy regimes changing as well as introduction of new government programs and safety net schemes . All these changes led to diversification of livelihood and income sources at the household level and diversification of agriculture and growth in non-land and non-farm rural employment as well as outmigration of rural men and women in search of better livelihoods.



Tablezz. Number of respondents migrating out of the village from the sample households, 2001 - 2014								
Region	Mahbubnagar		Akola		Solapur		All villages	
Year	Female	Male	Female	Male	Female	Male	Female	Male
2001	40	59	0	6	3	7	43	72
2002	34	85	0	3	3	13	37	101
2003	30	76	1	15	3	28	34	119
2004	46	112	2	16	2	22	50	150
2005	65	149	0	2	4	2	69	153
2006	47	132	0	6	0	2	47	140
2007	40	123	0	18	0	6	40	147
2008	45	132	0	29	2	9	47	170
2009	19	49	5	35	0	2	24	86
2010	11	46	1	12	0	2	12	60
2011	14	53	0	18	0	5	14	76
2012	13	48	0	11	0	7	13	66
2013	10	39	0	2	0	8	10	49
2014	8	43	0	6	0	8	8	57

Percentages							
Regionwise	Female				Male		
	Mahbubnagar	Akola	Shirapur		Mahbubnagar	Akola	Shirapur
2001	93.02	0.00	6.98		81.94	8.33	9.72
2002	91.89	0.00	8.11		84.16	2.97	12.87
2003	88.24	2.94	8.82		63.87	12.61	23.53
2004	92.00	4.00	4.00		74.67	10.67	14.67
2005	94.20	0.00	5.80		97.39	1.31	1.31
2006	100.00	0.00	0.00		94.29	4.29	1.43
2007	100.00	0.00	0.00		83.67	12.24	4.08
2008	95.74	0.00	4.26		77.65	17.06	5.29
2009	79.17	20.83	0.00		56.98	40.70	2.33
2010	91.67	8.33	0.00		76.67	20.00	3.33
2011	100.00	0.00	0.00		69.74	23.68	6.58
2012	100.00	0.00	0.00		72.73	16.67	10.61
2013	100.00	0.00	0.00		79.59	4.08	16.33
2014	100.00	0.00	0.00		75.44	10.53	14.04

4.7. Income analysis

5. Conclusions (to be completed)

Women are equally engaged in productive work, reproductive work and resting. The reproductive activities which are in the form of unpaid labor on their own homes and these activities tend to not accounted for, even by women themselves. Family and personal care is all taken together as time spent only for child care is difficult to account for by the women themselves, Women are engaged in the care of not just the children but also other members of the family like the elderly and the sick. Also sometimes there are multiple child care providers and women also multi-task child care with their other activities, a finding which is very similar to Jain ( ) in Bangladesh.

Women are playing an increased role in agriculture following the out–migration of male family members. New tasks such as managing irrigation and on farm technology and marketing are also becoming part of the female activities. Agriculture remains crucial for family members left behind, particularly for the poorest cultivators.

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