

Mainstreaming of Women in Watersheds Is Must for Enhancing Family Income

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Abstract

Despite the fact that women are the world's principal food producers and providers, they have long been deprived of their due share and identity. Kothapally is one of the initial watershed projects that demonstrated on ground that a holistic development model not only conserves natural resources for sustainable productivity and income improvement but also harnesses the synergies to tailor the benefits in mainstreaming women farmers. This has showcased the model to focus on selective activities that directly benefit women. Some important activities that increase incomes of women revolve around interventions like milk production, kitchen gardens, composting, value addition, non-farm livelihoods through capacity building, collectivization and market linkages.

Keywords

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9.1. Kothapally Watershed: An Inclusive Holistic Approach for Mainstreaming Women

In spite of women's substantial contribution to agricultural production, women in general practice are marginalized when it comes to land ownership, decision-making and their share of income. Earlier watershed guidelines covered land-based activities only, and as a result in India, most women who have no land rights were not direct beneficiaries of the watershed program. As a result, as indicated earlier in Chap. 2, without any tangible economic benefits, 50% of the population did not participate actively in the watershed development activities. Alongside ongoing policy and social reforms, it is high time that we make concerted efforts within existing opportunities for empowering women farmers by providing income enhancement options. The integrated watershed development approach framework followed in Kothapally watershed is not only one of the tested, sustainable and eco-friendly approaches to conserve soil and water resources for enabling productivity improvement and diversification but also mainstreaming of women through improving livelihoods and addressing equity issues (Wani et al. 2003, 2012, 2014a). By addressing the core requirement of providing knowledge about technical and financial aspects of income-generating enterprises along with a hand-holding support, women can carve their way out to improve incomes and secure justified identity in the society; this is an

exemplar case study in Kothapally. The holistic approach adopted in Kothapally was to focus on strengthening certain women-centric enterprises along with collectivization of participating women for addressing risks and effective market linkages. The focus of prominent enterprises were milk production through addressing feed, fodder and breed improvement, value addition, composting, nutri-kitchen gardens, seed banks and petty shops in the village.

AQ2

9.2. Strengthening Livestock-Based Enterprises

Livestock are integral part of farming, and especially dairy and poultry are in general in domain of women for meeting the household nutritional requirements as well as marginal sources of income through sale of extra production by the women farmers. Initial baseline surveys and farmer interactions showed very low milk productivity level in the watershed mainly attributed due to scarcity and poor quality fodder and low-yielding animals. With the increased water availability in the watershed, not only crop productivity was increased but also cropping intensity along with crop diversity resulting in additional fodder availability in the Kothapally watershed. With the increasing demand by the growing population, higher incomes and more health consciousness, there was rising demand for milk. Based on the increased fodder availability and also milk demand, this activity was prioritized for women farmers' income addition in the watershed. The baseline survey had indicated that there was no marketable surplus for milk in the village in 1998–1999 as milk production in the village was only around 250 l per day which was consumed locally (Shiferaw et al. 2002; Wani and Shiferaw 2005). Livestock is one of the most important sources of income for the families in dryland areas. Generally, women members in the family take care of the livestock-based activities, and it also results in improving family incomes. Soon after the watershed activities were initiated, the first and foremost thing was to improve the animal breed along with fodder development and subsequently introducing feed/concentrates for the livestock in the watershed to benefit the women farmers.

9.2.1. Expansion and Breed Improvement

During baseline, one of the major reasons identified for low productivity of livestock was prevalence of low-yielding (1–3 l per animal per day) animals in the village. Therefore, in partnership with BAIF NGO partner, breed improvement was taken as a prioritized activity in the watershed. To address the issue of improving productivity of animals in the village, we adopted artificial insemination (AI) approach using the semen of improved cow breed Holstein, and for buffaloes we used Jafarabadi breed semen. Initially to establish the AI Centre, there was resistance from the department of Animal Husbandry of the Government of Andhra Pradesh. The government AI Centre was located at Shankarpally which is about 13 km away from the Kothapally. We took up the issue with the collector highlighting that when animals are in heat it is not feasible to take animals 30 km away up and down. Moreover, there was no regularity of availability of the expert or the semen. With the approval from the collector, the Watershed Committee received the permission from the GoAP to start AI Centre in the village. We brought Bhartiya Agro Industries Foundation (BAIF) as a consortium partner in the Watershed Consortium. The BAIF had proven expertise for AI in the country, and we had good experience working with BAIF (Pune, Maharashtra) in the Madhya Pradesh Milli Watershed. We developed a model with BAIF and requested them to have a sustainable model to ensure that within 5 years the model should become self-sustainable. For this the village youth were trained in AI process, and villagers had to just give a phone call to the AI person about the right stage of the animal to conceive, and the representative will reach the farmer's home along with mobile AI unit. In consultation with the Watershed Committee, a subsidized fee per AI was fixed (Rs 30/animal up to 2004, Rs 50/animal up to 2014 and Rs 100/animal from 2015 onwards). The semen and the needed instruments including motorcycle, nitrogen gas container and phone were provided to the AI person. Following this approach in addition to Kothapally watershed, other four satellite watershed villages were also included in the AI program. Following this approach during the period 2003 till 2017, a total of about 4500 artificial inseminations (AI) were done in the local livestock – ~3000 in buffalo and ~1500 in cow. As a result, around 1500 AIs were confirmed and improved breed calves were born. The productivity of animals due to AI increased and the F1 animals were yielding 2–5 l per day as compared to 1–3 l per animal per day. In 2013, there was marketable surplus milk production with 2100 l per day.

9.2.2. Fodder Development

With the increased water availability, increased crop productivity quantity of crop residues also increased (Fig. 9.1). In addition, introduction of improved dual purpose cultivars improved quality fodder also. With water availability, farmers started cultivating green fodder in the watershed (Fig. 9.2).

Fig. 9.1

Good crop growth and biomass (which is used as cattle fodder) with improved practice in Kothapally watershed



Fig. 9.2

Improved fodder grass (Napier) cultivation in Kothapally watershed



It is well established fact that for good health and higher productivity, dairy cattle need good quality green roughages; more precisely dry matter requirement is around 2–3% of body weight. Quality grasses (e.g. Guinea, Napier, etc.) and legume fodder (e.g. cowpea, Lucerne, etc.) are required to meet protein and other nutrient requirements. In general, green fodder and legume component are lacking or in deficit, and straw is mostly major roughage. With the objective of boosting livestock productivity, green fodder production is promoted.

Moreover, the outcome of soil degradation in predominant crop-livestock farming system in the drylands is far beyond reducing grain production and quality (Wani et al. 2016); it also affects livestock feed quantity and quality (Blümmel et al. 2009; Hailelassie et al. 2011). In view of the increasingly important role of crop residue as feed components, the effects of soil health building through nutrient balancing on feed availability and feed quality are very important and show up in potential milk yield per ha by as high as 40% (Hailelassie et al. 2013). The role of soil health building in enhancing food quantity and quality and helping individuals and communities to build sustainable food security is well demonstrated in Kothapally.

9.2.3. Reliance for Procurement of Milk in the Village

As Kothapally was not on the Cooperative Milk Dairy procurement route and in 1998–1999, there was no marketable surplus of milk in the village, and there was no established milk marketing arrangement for the village. As the milk production started increasing, farmers started looking for the marketing channels. Initially one or two farmers started pooling milk together to take it to city for marketing. However, soon it became evident that to ensure good benefits to the farmers, we have to eliminate middlemen in the marketing channel. In discussions with the Reliance Industries, a supermarket chain was initiated, and in 2007 an automated milk procurement centre was established in the village. This centre provided a fair and fixed price with computerized fat % estimation and weighing facility for the farmers. In addition, the centre also provided animal feed to the farmers on credit basis as the milk price was paid every fortnightly basis. With this direct marketing to the Reliance, automatically more and more farmers started selling milk in the village itself. The details of the milk rates as well as the quantity of milk procured yearly basis are indicated in Table 9.1.

Table 9.1

Total milk sale and price realized in Kothapally village

Year	Milk collection by Reliance/Heritage group (litre)	Milk collection by Rajarajeswari group (litre)	Collection by private vendors (litre)	Total milk sale in the village (litre)	Cost of milk based on fat content (Rs/litre)		
					5% fat	7% fat	11% fat
2006	–	–	95,000	95,000			
2007	90,000	–	135,000	225,000	14.0	22.4	28.0
2008	72,000	–	222,000	294,000	16.0	22.4	32.0
2009	180,000	–	252,000	432,000	17.5	24.5	35.0
2010	144,000	–	257,000	401,000	20.0	28.0	40.5
2011	86,000	28,800	272,000	386,800	22.5	31.5	45.0
2012	82,600	43,200	228,500	354,300	25.0	33.0	50.0
2013	85,000	50,400	235,500	370,900	25.0	35.0	50.0
2014	80,200	57,600	246,000	383,800	27.5	38.5	55.0
2015	75,300	64,800	240,500	380,600	31.5	44.5	63.0
2016	57,600	64,800	229,500	351,900	29.0	40.5	58.0
2017	65,200	60,200	227,000	352,400	30.0	42.0	60.0

9.2.4. Spent Malt as a Microenterprise to Benefit Women and Milk Producers: A Business Model

Productivity of milch animals and business profitability is largely dependent on fodder/feed availability as well as its cost and quality. In a common situation of lack of green fodder in general, especially with lactating animal, feed/concentrate is required to make up for lacking protein and nutrients. Spent malt is a good feed material for livestock for improving health, milk yield and fat content. Spent malt is a byproduct of brewing industry, consisting of the residue of malt and grain which contains carbohydrates, proteins, lignin and water-soluble vitamins as animal feed. It is quite palatable and is readily consumed by animals. Two kilograms of spent malt (on dry weight basis) provide about 400 g protein which very well meets the requirement of 350 g per day protein required for maintenance of adult cattle of ~500–600 kg weight (Table 9.2). Macro- and micronutrients are required for good health and immunity in cattle. Spent malt is a rich source of macro- and micronutrients – 2 kg spent malt provides nutrients at par or more than the recommended 100 g mineral mixture per day.

Table 9.2

Nutritive value of spent malt and recommended mineral mixture

Nutrient	Spent malt: nutrient composition	2 kg spent malt: nutritive value	100 g mineral mixture: nutritive value
Nitrogen (%)	3.66%	–	–
Protein (%)	22%	440 g	–

Nutrient	Spent malt: nutrient composition	2 kg spent malt: nutritive value	100 g mineral mixture: nutritive value
Phosphorus	0.46%	9.20 g	9.00 g
Iron	205 ppm	0.41 g	0.40 g
Zinc	52 ppm	0.11 g	0.30 g
Copper	248 ppm	0.50 g	0.06 g
Manganese	29.5 ppm	0.06 g	0.10 g
Sulphur	2655 ppm	5.31 g	0.40 g
Calcium	2098 ppm	4.20 g	18.0 g
Magnesium	1602 ppm	3.21 g	5.00 g

There is interesting story of popularization of spent malt as animal feed in internationally known watershed at Kothapally. Actually, ICRISAT and SABMiller India were into a Memorandum of Agreement (MoA) in August 2009 for collaborative watershed activities in Fasalvadi, Chakriyal, Venkatakishtapur and Shivampet villages which were later expanded to ten villages. In this regard, to learn the watershed intervention, Fasalvadi farmers had an exposure visit to Adarsha watershed at Kothapally, during which, farmers from Kothapally came to know about the spent malt initiative and its benefits realized by Fasalvadi women. Kothapally is a village with milk production activity of around 2100 l per day. In this context, lead women farmers in Kothapally watershed realized opportunities of improving milk production through getting spent malt from nearby SABMiller brewery. They requested ICRISAT to discuss with SABMiller India and establish a spent malt initiative. ICRISAT intervened with its CSR partner to facilitate and launch Spent Malt activity in Kothapally village on 17 June 2013. Women farmers were organized into SHGs to handle all logistics of transportation from the factory, and distribution amongst fellow farmers and a successful business model was implemented. Training component was handled by ICRISAT, and major points to take care in spent malt use are as under:

- Spent malt (wet) to be consumed within 24 h. Thereafter, it gets fermented and sour.
- Not be fed to cattle after 48 h – worms may get developed and cattle health may be affected.
- Fresh spent malt needs to be dried for storage and use later on.
- Quantity to be fed is 4–5 kg spent malt/day/animal (2–2.5 kg in the morning and same in the evening).

The basic requirements in this initiative are as follows:

- Vehicle arrangement for lifting spent malt from brewery to respective village
- Place with rooftop for unloading and storing spent malt
- Plastic drums (200 l size) for storing spent malt
- Buckets/baskets for unloading spent malt
- Weighing balance for distribution of spent malt to farmers

- Inventory books for maintaining disbursement details, etc.

Tejasri women's SHG in Adarsha watershed, Kothapally village, in Ranga Reddy district, is handling the spent malt-based activity which is a group of 12 women members. Around 96 households in the watershed purchase spent malt to feed around 559 milch animals (Fig. 9.3). Daily, around 2580 kg spent malt is used to feed cattle. With use of spent malt as animal feed, farmers have observed increased milk production of about 2 l per animal per day with improved fat content. Due to this, the gross income in the village is increased by about Rs. 46,000 per day (about Rs 36,000 net income) on account of increased milk production in the village. On a monthly basis, more than Rs 11,000/- net income is increased per household of participating farmers. Tejasri group that handles the activity procures spent malt at the rate of Rs 2.75 per kg and sells at the rate of Rs 4 per kg. Members use Rs 1.25 per kg for transportation and handling charges by the group. Through this, member handling day-to-day operations gets around Rs 10,000/- per month income and contributes Rs 1000/- for the group corpus fund.

Fig. 9.3

Scaling-up of spent malt as animal feed through women SHG in Kothapally



With the success of model in Kothapally, it has captured the attention of many stakeholders and now scaled-out to other locations like Neemrana (Rajasthan), Murthal (Haryana), Hyderabad (Telangana), Mysore (Karnataka), etc.

9.3. Nursery Raising and Nutri-kitchen Gardens

Nursery raising of fruits, plantation, vegetable and ornamentals is a potential opportunity for women farmers as a livelihood activity. Women in Kothapally watershed adopted nursery raising of fruits and plantation crops as a livelihood activity. During the watershed program, women raised nurseries and supplied 2500 fruit trees and teak plants along with about 50,000 *Gliricidia* saplings planted on bunds for generating N-rich organic matter. Nurseries in horticulture plants is important area for income generation for women due to the large scope of horticulture sector in total per cent share of around 30% in agricultural output and a key area to achieve desired doubling of farmers' income and resilience in the drylands. In horticulture sector, per cent share of production of fruits and plantation crops is quite significant at 37%. Raising ornamental plants for city markets is also a big opportunity. In view of low soil organic carbon levels of farmers' fields and low quantities of recyclable organic carbon, biomass generation through nitrogen-rich green manure plants is also need of the hour. In this context, *Gliricidia* plantations on the farm boundaries have proved very beneficial for adding carbon and nutrients to the fields through chopping leaves before rainy, post-rainy and summer seasons. On-station watershed studies at ICRISAT have shown that *Gliricidia* loppings provide 30 kg N ha⁻¹ year⁻¹ without adversely affecting crop yield (Wani et al. 2006).

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Kothapally watershed has pilot tested the model of nutri-kitchen gardens through which women cannot only improve nutrition of household but also earn income (or save expenditure) through sale of vegetables. Women are provided seeds of vegetable for cultivation in 10–20 m² as kitchen gardens along with know-how of cultivation. Most women use house-made compost for vegetable production. Nutri-kitchen garden kits with different vegetable crops (tomato, brinjal, okra, bottle gourd, bitter gourd, ridge gourd, *Palak* and *Amaranthus*) were provided to 110 households every year (2016–2017 and 2017–2019) in Kothapally village to grow vegetables in their backyard for their household consumption resulting in saving expenditure on purchase of vegetables. These 110 households produced about 3000 kg of vegetables. The average household production is about 28 kg of vegetables with a saving of around Rs 800/family while improving household nutrition.

9.4. Composting: Recycling Wastes

With awareness about health, environment and resource use, the demand for organic-based products is increasing. Kothapally watershed is very close to Hyderabad city and better positioned to fulfil the huge demand from the city for compost use in ornamentals and kitchen or roof gardens in addition to use in farmers' agricultural fields. With such huge scope, women in Kothapally have adopted composting of residues and household waste as a remunerative business activity.

Composting is the technology for conversion of bulky organic wastes into low-volume nutrient-enriched and stable product. Traditional composting (farmers' practices of heaping straw and dung) is very time consuming and relatively less effective. In such a case, using half decomposed compost/manure/plant residue creates many plant nutrient and pest-related problems, rather than benefits. Vermicomposting is one of the tested technologies to effectively recycle on-farm wastes to produce quality compost for use in crop production (Chander et al. 2013, 2018; Wani et al. 2014a, b). Vermicomposting hastens the decomposition process through physical breakdown of the raw biomass coupled with mixing of vast spectrum of microbes with the biomass while passing through earthworm gut. The microbes of earthworm gut are highly potential in digesting the organic materials as well as polysaccharides (Aira et al. 2007; Zhang et al. 2000). Apparently high microbial activity under composting have an indirect role in improving compost nutrient quality by nitrogen fixers, nitrifiers and sulphur oxidizers (Richardson and Simpson 2011) and may also synthesize chemicals which act as plant growth hormones (Pizzeghello et al. 2001; Ghosh et al. 2003; Tomati et al. 1988).

AQ4

In Kothapally watershed, the composting activity was initially adopted by 10 women farmers (Wani et al. 2016); however, by present day, 60 women farmers are involved in it (Fig. 9.4). One unit produces around 2500 kg compost in a year. Farmers get a price of about Rs 4/- per kg compost, and thus each person is able to earn

around Rs 10,000/- a year through this activity. This side activity not only brings incomes to women farmers but also recycles household and on-farm wastes which otherwise do not find any effective alternate use except creating a nuisance. This activity also contributes to cleanliness drive in the village. One of the SHGs, namely Shivaganga group, is also engaged in making vermiwash through making outlets for collection of washings in composting unit. Per unit 150–200 l vermiwash is produced and is sold at Rs 4/- per litre. It is quite popular with vegetable farmers to improve quantity and quality of the produce (Wani et al. 2014b; Chander et al. 2013).

Fig. 9.4

Recycling of on-farm wastes into compost using vermicomposting technology in Kothapally



9.5. Improved Food, Nutrition and Livelihood Security

With the watershed interventions in Kothapally, food production increased as a result of diversification from dominant non-food crops to food crops like maize, sorghum and pigeon pea. Kothapally was predominantly a cotton-growing area prior to project implementation. The area under cotton was 200 ha in 1998. Maize, chickpea, sorghum, pigeon pea, vegetables and rice were grown in very limited area. After 4 years of activities in Adarsha watershed, the area under cotton cultivation decreased from 200 to 80 ha (60% decline) with simultaneous increases in maize and pigeon pea. The area under maize and pigeon pea increased more than threefold from 60–200 to 50–180 ha, respectively, within 4 years. The area under chickpea also increased twofold during the same period (Wani et al. 2006). With enhanced in situ and ex situ water availability, farmers started cultivating vegetables. Alongside, the productivity of crops increased by two- to threefold in crops like

maize and sorghum as compared with the base year during 1998. All these changes brought in enhanced and diversified availability of food along with surpluses for income enhancement. With the changes scenario, migration of villagers stopped and brought in enhanced social security to family and women as such.

Moreover, the linkages of soil fertility management and fertilizer use with food quality and nutrition are well established (Chander et al. 2013; Wani and Chander 2016; Wani et al. 2017). In this regard, need-based fertilizer use has improved food nutritional quality and effectively reaching out to the children and women in the watershed. The impacts of soil health management are far beyond grain production and quality, especially in a predominant crop–livestock farming system in the watershed where crop residue serve as important feed components and their quantity and quality is positively affected with such a balanced fertilizer use strategy and HYVs in the watershed.

9.6. Other Allied Enterprises

Watershed experience highlighted clearly that household and women incomes as such can be significantly enhanced by shortening the value chain and strengthening networks for primary processing at farm level. In this regard, dal processing is a major activity adopted by women SHGs. Village seed bank is also an important activity where women are involved. This activity not only brings income to women but also ensures availability of good quality of seed for cultivation leading to higher production in the village. With support of ICRISAT, women SHGs also undertook specialized activities like *Helicoverpa* nuclear polyhedrosis virus (HNPV) production for minimizing pest damage in crops like cotton, pigeon pea and chickpea. Alongside, the project has given high priority to training village-level scouts to identify various pests and their natural enemies in different crops. With the economy picking up in the village, women have adopted other non-farm activities as well like petty shops as livelihood source for them.

9.7. Collectivization and Market Linkages

Small business size and little bargaining power of women farmers in the country is the major cause for most of the problems. Hence, collectivization of women producers is one of the most effective pathways to address the many challenges, and hence women in the watershed are organized into self-help groups (SHGs). The SHGs enabled reaping the benefits of economies of scale, reduce the transaction costs, improve profit margins and effectively manage risks and uncertainties. A strong stewardship for capacity building and strengthening knowledge base of women farmers helped in formulating good business plans and management. Organizing as SHG has not only enabled ease of business doing but also facilitated market linkages in a business model. With large number of women organized into milk production, Reliance has opened a milk collection centre which provides competitive price to the women. Similarly, other women are organized into SHGs around activities like composting, dal processing, seed banks, nursery raising and small-scale vegetable production.

9.8. Awareness and Capacity Building

Amongst others, one of the reasons for women lagging behind is the knowledge gap between ‘What to do’ and ‘How to do it’. In view of human resource constraints and poor knowledge delivery system, i.e. extension system, the challenge to reach out to all women farmers is a huge challenge. The Kothapally watershed demonstrated the model that the information delivery mechanism can be strengthened by utilizing the services of practicing women farmers in the villages as lead farmers or farmer facilitators who stay in the villages and can effectively transmit knowledge and bring the fellow farmers on the board. The lead farmers across SHGs were given exposure visits and thorough trainings for various livelihood options, and they are those who transmitted it to the fellow farmers in SHGs. Exposure visits to ICRISAT campus and breweries and hands-on training courses were part of capacity building programs along with day-to-day hand-holding support during the watershed program implementation period during 1999–2003. This participatory program has developed women leaders with desired capacity to take forward various programs and has managed well even after completion of the watershed project in 2003. Women farmers have not only sustained the livelihoods but evolved over time and

expanded the enterprises by seeking help of experts as and when needed. With progress over the years, Kothapally has become a bright spot for exposure visits for women from other regions to learn from and engage in livelihood activities to increase their incomes.

With increasing connectivity through Digital India initiative of the Government of India, there is wide scope for decision-making, monitoring, impact analysis and knowledge dissemination using ICT. As trained human resource is a major constraint, various ICTs are available which can bridge the gap between women farmer and knowledge generator. Rapidly evolving information technology industry and favourable environment for ICT in agriculture are giving a great boost to agricultural extension.

9.9. Summary and Key Findings

It has been demonstrated in a study that mere engagement of women in watershed activities does not benefit women unless the income-generating activities are brought in to benefit the women. It was noted that women having more income in the watersheds at their disposal were having more confidence, self-esteem and decision-making authority in the family (Sreedevi et al. 2004; Sreedevi and Wani 2007). Initially, it was noted that Kothapally watershed was at the lowest rung on the ladder amongst the three watersheds studied for benefits to women. Taking these results in to consideration, subsequently, more income-generating activities were promoted in the Kothapally watershed.

Successful models of mainstreaming women farmers and increasing their incomes have been put in place in Kothapally watershed through women-focused interventions like animal rearing, spent malt as animal feed, kitchen gardens, composting, value addition and non-farm-based livelihoods. With direct benefits to women and family as such, these need to be scaled out in other geographies. Milk production is in general a big activity in the domain of women, and strategic marketing interventions like cooperatives in India have linked women to the markets to some extent, but a lot more need to be done for coverage across the country. Private players as done in Kothapally also need to be roped for market linkages in many areas. The next opportunities lie in increasing production as is demonstrated in Kothapally though addressing the issues of fodder scarcity in drylands, making available the concentrates, breed improvement and expansion. In current times, with focus to double farmers' incomes, primary processing at farm level is suggested to retain the maximum value share with farmers. Kothapally watershed has piloted dal processing as women-focused enterprise, and there are similar many other opportunities where women farmers can be roped in for value addition. Poor financial condition and poor risk taking ability are major deterrents for majority of women farmers for the infrastructural and marketing requirements. To address the issues of family nutrition and income, promotion of kitchen gardens in rural areas could be a very important activity as is demonstrated in Kothapally. With the economy picking up with various interventions in the watersheds, there are other non-farm activities generated where women need to be roped in. In most of the interventions, a favourable policy to support financially and address risks through collectivization and market linkages is need of the hour. A framework of capacity building and hand-holding support is required in the policy to take forward the cause of mainstreaming women farmers and improving their incomes.

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