



Establishing community fodder banks through public-private partnership: An action-oriented approach

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ABSTRACT

Community fodder banks have been advocated as one of the promising solutions to minimize fodder scarcity in India. Unfortunately, the popularization of such extension activities has remained woefully weak across the country and very few initiatives have been undertaken in this regard. An action-oriented participatory approach was initiated in the Kangra district of Himachal Pradesh to establish community fodder banks. The approach involved convergence among CSK Himachal Pradesh Agricultural University, Palampur; Himmothani Society, Palampur; NABARD, Shimla; local Panchayati Raj institutions and ICAR-IVRI, Palampur. The women dairy farmers were mobilized into self-help groups. Awareness meetings followed by site selection, cleaning of the area, land preparation, plantation, fencing and periodical visits were conducted. Four community fodder banks were established in waste and unused common lands, and 669.53 quintals of green fodder was harvested at established fodder banks in 1 year period (July 2020-August 2021). The cost of setting up fodder banks in the convergence approach ranged from ₹1.03 lakhs to ₹2.05 lakhs. The transformation of wasteland into fodder plots through project intervention has improved fodder availability in the region and will expand livestock-based livelihoods. The public-private partnership mode helped to bring convergence in activities of the project implementing organizations through sharing of work, strengths and knowledge exchange.

Keywords: Community fodder banks, Convergence, Public private partnership, Self-help groups

Community fodder banks have potential to bring self-reliance in terms of fodder availability among Indian villages during times of scarcity (Anonymous 2005). A community fodder bank is nothing but a group of farmers coming together to raise multiple fodder crops including trees, grasses and legumes largely in non-arable or wastelands to meet the fodder requirement, especially during the lean periods. These banks not only increase fodder availability but also reduce soil erosion, replenish soil fertility as nitrogen content of the soil is rebuilt (Venugopalan *et al.* 2016). Community fodder banks have been advocated as one of the promising solutions to minimize fodder scarcity in India (Shalini and Maikhuri 2012). The importance of community fodder banks can be understood from the fact that India has a net deficit of 63% green fodder, 24% dry crop residues and 64% feeds (Kumar *et al.* 2012).

This deficit has resulted in sub-optimal performance of livestock production in India as animals suffer from poor health and productivity (Roy *et al.* 2019). The deficit has created an exorbitant increase in prices of feed and crop residues in many parts of the country (Owen *et al.* 2012).

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Green fodder cultivation helps to cut down the feeding cost which forms 65-70% cost of livestock rearing (GoI 2012). Fodder banks reduce the cost of animal feeding through supply of forages (CTCN 2016) and have an important role in livestock productivity. Unfortunately, cultivated area for fodder cannot be increased as its cultivation competes with cereal grain production in the country (Kumar *et al.* 2012). Thus, setting up community fodder bank in wastelands is useful way to improve fodder availability in the villages for sustainable dairy development. The convergence of various actors and sectors facilitates faster adoption of fodder grass production technology (Mukherjee *et al.* 2020). Public Private Partnership (PPP) in agriculture can be understood as shared mechanism among partners for input, resource, market, risk, technology and benefits (Ponnusamy 2013). The present study explains the public private partnership model as action research in the hills of Himachal Pradesh, India.

MATERIALS AND METHODS

The present study was a part of NABARD funded research project on community fodder interventions for dairy development in district Kangra, Himachal Pradesh implemented by the Department of Veterinary and Animal Husbandry Extension Education, Dr G C Negi College of Veterinary and Animal Sciences, Palampur, Himachal

Pradesh since 2020. Under the project, four community fodder banks were established in two purposively selected blocks viz. Baijnath and Rait of district Kangra, Himachal Pradesh. Large number of farmers depend on dairying for earning their livelihood in these blocks of the district.

From these two blocks, eight village panchayats were purposively selected. The remote village panchayats of Ghor Pith, Kandal, Utrala, Madhopur in Baijnath and Bhaled, Rirkumar, Lahri, and Salli of Rait Blocks were selected purposively due to presence of Himmothan Society, a prominent NGO working on livelihood of farmers. The two organizations viz. CSKHPKV, Palampur and Himmothan Society entered into public private partnership by signing a Memorandum of Understanding for implementing community fodder interventions in these regions. The SHG formation was started by Himmothan Society which was later scaled up by project staff of Department of Veterinary Extension Education. The members were encouraged to contribute minimal membership fees of ₹100. Capacity building of SHGs was facilitated by project staff/scientists of the Department of Veterinary and Animal Husbandry Extension Education and Himmothan Society. Community wastelands owned by SHG members were selected for the development of fodder banks. Once the site was finalized, the resolution to utilize funds was passed by Gram Panchayat under MNREGA.

RESULTS AND DISCUSSION

The four community fodder banks were set up over a period of 18 months (Table 1). The procedure of setting up the bank is discussed below.

Awareness meetings about community fodder banks: The meetings with self-help groups were held by field staff of Himmothan Society and Department of Veterinary and Animal Husbandry Extension Education. Beside this,

society through group meetings explained the concept to local panchayat representatives and sensitized them towards mobilization of panchayat resources for the proposed activity.

Selection of site: Group meetings with SHG members and local Gram Panchayats were conducted to select the site. Wastelands/ common property resources (CPRs)/ uncultivated lands owned by SHG members were selected to develop fodder banks.

Land preparation: Most of the land selected were common wastelands. Rough terrains unutilised by community and infested with weeds were mostly selected. Thus, cleaning of area was the first step. Afterward, pre-plantation work was carried out on the plot which included staggered contour trenches for water conservation and grass plantation, pit digging for plants and fencing, gully plugs, recharge pits and compost pits. These measures reduced erosion of topsoil, increased the moisture regime of the plots by increasing water infiltration and increased the soil fertility.

Plantation: Plantation work was carried out in the rainy season (July-August) as climatic conditions were better suited and favourable for adaptation and growth of grasses. Improved varieties of fodder grasses mainly Napier Bajra Hybrid, Setaria, Super Napier, Paspalum, and Bracharia were planted. Out of these, the first three fodder species grew well. Beside this, common fodder/ medicinal tree plants such as Mulberry (*Morus alba*), Indian gooseberry (*Phyllanthus emblica*), Jaman (*Syzygium cumini*), Kachnar (*Bauhinia variegata*) and Oak (*Quercus spp.*) were been planted. Based on the number of trenches created in the plot, 40,000 fodder roots were planted in each community fodder bank. The labour work for pre-plantation activities and plantation was done under MNREGA funds provided by local panchayats.

Table 1. Timeline for setting up community fodder banks

Activity	Phase I	Phase- II	Phase- III	Quarter I
	January-June 2020	July-October 2020	November- March 2021	April-August 2021
Formation of self-help groups	✓			
Awareness meetings with SHGs	✓			
Meetings with panchayat representatives on the concept of fodder bank	✓			
Preparation of budget by panchayat	✓			
Gram Sabha to approve the resolution for establishing community fodder banks with budget for land preparation	✓			
Selection of site		✓		
Land preparation by beneficiaries		✓		
Preparation of trenches and plantation of fodder grasses and trees		✓		
Visits by staff to monitor and co-ordinate the activities	✓	✓	✓	
First harvest of fodder				✓
Second harvest of fodder				✓

Table 2. Estimated fodder production in community fodder banks in selected village panchayats during 2020-21

Particular	Village Lahri Rait Block	Village Bhaled Rait Block	Village Kandral Baijnath Block	Village Ghor Pith Baijnath Block
Land	1.5 hectares	1.5 hectares	1.5 hectares	2 hectares
Previous nature of land before intervention	Unutilised degraded wastelands due to overgrazing and occasional bushes	Unutilised degraded wastelands due to overgrazing and occasional bushes	Unutilised degraded wastelands due to overgrazing and occasional bushes	Unutilised degraded wastelands due to overgrazing and occasional bushes
Type of superior grasses established	Napier Bajra Hybrid, Setaria and Super Napier	Napier Bajra Hybrid, Setaria and Super Napier	Napier Bajra Hybrid, Setaria and Super Napier	Napier Bajra Hybrid, Setaria and Super Napier
Number of trenches created in each fodder bank	350	490	458	687
depending upon soil fertility for superior fodder				
Average trench size (in square feet)	14	12	13.5	14.24
Average yield (in kg) per trench of superior fodder in one cutting	4.90	4.85	5.05	5.05
Total yield from all trenches in one harvest	$350 \times 4.90 = 1715$ (17.15 quintals)	$490 \times 4.85 = 2180.5$ (21.80 quintals)	$458 \times 5.05 = 2312.9$ (23.13 quintals)	$687 \times 5.05 = 3469.35$ (34.69 quintals)
Number of harvestings in one year	Two (June and August)	Two (June and August)	Two (June and August)	Two (June and August)
Total roots planted	20,000	20,000	20,000	30,000
High quality fodder yield per year	34.30 quintals	43.61 quintals	46.25 quintals	69.38 quintals
Normal area left as trenches for growth of normal grass	Total trenches = 11610	Total trenches = 8277	Total trenches = 11502	Total trenches = 10651
Normal grass yield from remaining area in the fodder bank	1.05 kg	1.45 kg	1.10 kg	1.01 kg
Total yield from one trench for inferior grass	$1.05 \text{ kg} \times 11610 \text{ trenches} = 12190.5 \text{ kg}$ (121.90 quintals)	$1.45 \text{ kg} \times 8277 \text{ trenches} = 12001.65 \text{ kg}$ (120 quintals)	$1.10 \text{ kg} \times 11502 \text{ trenches} = 12652.2 \text{ kg}$ (126.52 quintals)	$1.01 \text{ kg} \times 10651 \text{ trenches} = 10757.51 \text{ kg}$ (107.57 quintals)
Total green fodder production in a year	$34.3 + 121.9 = 156.2$ quintals	$43.61 + 120 = 163.61$ quintals	$46.25 + 126.52 = 172.77$ quintals	$69.38 + 107.57 = 176.95$ quintals

Tree species planted	Mulberry (<i>Morus alba</i>)	Mulberry (<i>Morus alba</i>)	Mulberry (<i>Morus alba</i>)	Mulberry (<i>Morus alba</i>)
	Indian gooseberry (<i>Phyllanthus emblica</i>)	Indian gooseberry (<i>Phyllanthus emblica</i>)	Indian gooseberry (<i>Phyllanthus emblica</i>)	Indian gooseberry (<i>Phyllanthus emblica</i>)
	Jaman (<i>Syzygium cumini</i>)	Jaman (<i>Syzygium cumini</i>)	Jaman (<i>Syzygium cumini</i>)	Jaman (<i>Syzygium cumini</i>)
	Orchid tree (<i>Bauhinia variegata</i>)	Orchid tree (<i>Bauhinia variegata</i>)	Orchid tree (<i>Bauhinia variegata</i>)	Orchid tree (<i>Bauhinia variegata</i>)
	Oak (<i>Quercus spp.</i>)	Oak (<i>Quercus spp.</i>)	Oak (<i>Quercus spp.</i>)	Oak (<i>Quercus spp.</i>)
Number of beneficiaries	10	12	14	20
Cost for setting up of fodder bank	Beneficiary contribution = ₹ 4,772 Labour through MNREGA = ₹ 28,104 Funds from NABARD for fencing = ₹ 25,000 Funds from Himmothan Society = ₹ 25,040 Cost of fodder roots including transportation from CSKHPKV to village = ₹ 21,000 Total cost = ₹ 103,916	Beneficiary contribution = ₹ 4,272 Labour through MNREGA = ₹ 44,228 Funds from NABARD for fencing = ₹ 25,000 Funds from Himmothan Society = ₹ 24,960 Cost of fodder roots including transportation from CSKHPKV to village = ₹ 21,300 Total cost = ₹ 119,760	Beneficiary contribution = ₹ 10,160 Labour through MNREGA = ₹ 59,420 Funds from NABARD for fencing = ₹ 25,000 Cost of fodder roots including transportation from CSKHPKV to village = ₹ 15,100 Total cost = ₹ 109,680	Beneficiary contribution = ₹ 12,000 Labour through MNREGA = ₹ 1,51,950 Funds from NABARD for fencing = ₹ 25,000 Cost of fodder roots including transportation from CSKHPKV to village = ₹ 15,600 Total cost = ₹ 204,550

Fencing: Most of these proposed fodder banks were established in common lands and wastelands, so it was extremely important to protect the area from cattle grazing, theft or any other damage. Therefore the entire area was fenced with poles and barbed wires after the plantation activities.

Protection and management: Protection and management of fodder banks have remained a very crucial aspect for the success of this entire intervention. Since each bank was assigned to one or more SHG groups, they were responsible for the protection from cattle grazing, taking care of plants, fencing material and theft of grasses. The area of each fodder bank was subdivided equally among the group members for the ease of weed management and protection. Each group member was responsible for weeding, intercultural operations and manuring their own portion. During the time of harvest, every member cut the grass of allotted area of the bank.

Estimated fodder production from community fodder banks

The SHG members had harvested improved fodder grasses in the bank twice till 31 August 2021. The fodder grasses were harvested in the months of June 2021 and August 2021. Fodder production in one year appeared sufficient as the area had negligible fodder production before intervention. The estimated fodder production from various community fodder banks in four village panchayats is given in Table 2.

Four community fodder banks of size 1.5-2 hectares were established in community wastelands during 2020-21 in villages of Lahri and Bhaled in Rait Block and Kandral and Ghor Pith in Baijnath block. Fodder grasses of Napier Bazra Hybrid and Setaria were established as suggested by agronomists of IVRI, Palampur, and CSK Himachal Pradesh Agricultural University, Palampur. Super Napier was also established as this was more popular among farming communities in the district. These grasses were established through the creation of trenches in the relatively fertile part of the wastelands.

Depending upon the availability of suitable areas in the fodder plots, the total number of trenches created to set up superior fodder varied from 350 to 687 in each bank. An average trench size of 12 to 14.24 square feet was created to plant superior fodder roots. The first harvest was taken almost 10-11 months (June 2021) after plantation.

Average fodder yield from one trench varied from 4.90 to 5.05 kg. Therefore, the total yield of superior fodder varied from 17.15 quintals to 34.69 quintals in one harvest. A total of two harvest were taken in months of the last week of June and last week of August 2021. Thus, average fodder production of superior grass (Napier Bajra Hybrid & Setaria) varied from 34.30 quintals to 69.38 quintals. Besides, due to protection through fencing, the local grass also got well established and its yield ranged from 120 quintals to 176.96 quintals in various fodder banks.

Cost of setting up fodder banks

The cost of setting up fodder banks was shared among various partners of the project. In villages of Rait block, the maximum cost incurred in fencing ranged from ₹49,960 to ₹50,040 (Contribution from Himmothan Society and NABARD). This was followed by the cost involved in labour work through the Mahatma Gandhi National Rural Employment Guarantee Act (MGNREGA) available with Gram Panchayats of two villages. Cost of procurement and transportation of fodder grasses ranged from ₹21,000 to ₹21,300 as these villages are slightly distantly located (90 Km) from CSKHPKV/IGFRI fodder farms, Palampur. The beneficiary contribution (₹4272 and ₹4772) was used to purchase fodder trees from the local forest department.

In two village panchayats (Kandral and Ghor Pith) of Baijnath block, maximum cost was incurred on labour expenses to clean the area, digging of trenches and plantation. These two areas were previously infested with weeds such as *Lantana camara* which increased the labour costs to clean the area. The cost incurred on fencing of area was slightly less at ₹25,000 for each fodder bank as local wooden poles were provided by the community. Cost of procurement and transportation of fodder grasses ranged from ₹15,100 to ₹15,600 as these fodder banks were nearer (45 km) to CSKHPKV/IGFRI fodder farm, Palampur. The beneficiary contribution (10,160 and 12,000) was used to purchase fodder trees from the local forest department.

Thus, the cost of setting up fodder banks in the convergence approach varied and ranged from ₹1.03 lakhs to ₹2.04 lakhs. The maximum cost of setting up a community fodder bank was incurred in village Ghor Pith as it had more area (2 hectares) and consequently more labour expenses to clean the area filled with weeds.

Role of Public Private Partnership in community fodder production

Himmothan Society's field presence in remotely located villages and its rapport with farmers helped Department of Veterinary Extension Education, CSKHPKV to establish social linkages with SHG members. The farmer-to-farmer contact of Himmothan Society on individual basis at village level helped in community mobilisation and collective action. Further the society undertook formation of SHGs and activated group dynamics among members. It convinced few SHG members to contribute minimal financial amount (Table 2) for setting up of fodder banks near their villages. The organisation conducted meetings with the local panchayat representatives and mobilised funds under MNREGA for land preparation to grow fodder in wastelands.

However, the staff of society lacked expertise on fodder and dairy extension activities. Further, it did not have sufficient inputs, research support and finance to undertake fodder development activities on a larger scale.

The Department of Veterinary Extension Education received funds from NABARD in the form of a project grant of ₹24.73 lakhs. Its linkage with other research

establishments (Department of Agronomy, CSKHPKV, Palampur and ICAR-IGFRI Fodder Farm, Palampur) helped in procurement, supply of high genetics planting materials and other needed inputs to set up fodder banks. The department organised regular small group trainings, on-site visits and provided technical guidance to SHG members on fodder cultivation, dairy animal feeding and livestock management.

Community management initiatives such as fodder banks require collective action by group of people. Public institutions such as Department of Veterinary Extension Education, CSKHPKV, Palampur had limited outreach with farmers located in the remote project locations. Group-organizing skills of Himmothan Society were particularly useful in the initial stage of the project. The society worked in close connection with people, motivated SHG members and local panchayats for site selection, beneficiary contribution and allocation of funds under MNREGA labour for the fodder banks. Thus, it reduced the burden of collective action for CSKHPKV, Palampur.

The Department of Veterinary Extension Education had access to different kinds of resources (human, technical, financial, and material) to make them available to communities. It implemented specialized project on community fodder production, conducted village based fodder and dairy trainings, motivated farmers to adopt recommended technologies and ensured record-keeping of performed activities and results of work done.

The study recommends that establishing community fodder banks in public private partnership mode can be more effective as public actors can provide technical, financial and monitoring support, while private actors help communities by informing and directing them to the resources made available. The findings revealed the complementary role of CSKHPKV and Himmothan Society in community fodder management and suggests that it would be fruitful in future to implement such type of community action activities with interdependence of public and private sector.

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REFERENCES

- Anonymous. 2005. Community Fodder Banks: A guideline. Drought Proofing Cell, Kutch Nav Nirman Abhiyan Dr Rajaram Campus, Nr. St. Xavier's English Primary School, Bhuj-Kutch, India.
- CTCN. 2016. Fodder banks: A technology option document. Climate Technology Centre and Network, United Nations Environment Programme Copenhagen, Denmark.
- GoI. 2012. Report of the Working Group on Animal Husbandry and Dairying. 12th Five Year Plan, 2012- 2017. Planning Commission, New Delhi, India.

- Kumar S, Agrawal R K, Dixit A K, Rai A K, Singh J B and Rai S K. 2012. Forage production technology for arable lands. *Technology Bulletin* **39**(9): 255–60.
- Mukherjee P K, Singh B P and Chander M. 2020. Convergence of dynamic extension approaches for promoting Bajra napier hybrid among the livestock farmers: a success story in Uttar Pradesh. *Journal of Crop and Weed* **16**(1): 167–71.
- Owen E, Smith T and Makkar H. 2012. Successes and failures with animal nutrition practices and technologies in developing countries: A synthesis of an FAO e-conference. *Animal Feed Science and Technology* **174**(3-4): 211–26.
- Ponnusamy K. 2013. Impact of public private partnership in agriculture: A review. *Indian Journal of Agricultural Sciences* **83**(8): 803–08.
- Roy A K, Agrawal R K, Bhardwaj N R, Mishra A K and Mahanta S K. 2019. Revisiting National Forage Demand and Availability. *Indian Fodder Scenario: Redefining State Wise Status*. (Eds) A K Roy, R K Agrawal, N R Bhardwaj. ICAR- AICRP on Forage Crops and Utilization, Jhansi, India, pp. 1–21.
- Shalini D and Maikhuri R K. 2012. Fodder banks can reduce women drudgery and anthropogenic pressure from forests of Western Himalaya. *Current Science* **103**(7): 763.
- Venugopalan V K, Prabhakar M, Gopinath K A, Pankaj P K and Rao C S. 2016. Community Fodder Banks for addressing forage shortage in rainfed areas. *Indian Farming* **66**(2): 21–25.