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A HANDBOOK OF

Technologies And Extension Approaches From The Sustainable Soil Management Programme

Sustainable Soil Management Programme

HELVETAS Swiss Intercooperation | NEPAL

Published by:
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Cover Photo:
On-farm training to experienced leader farmers (ELFs), Jalpa VDC, Khotang District

Publishing Year : 2014

SSMP is implemented in Collaboration with Government of Nepal and Civil Society Actors of Nepal.
It is financed by the Swiss Agency for Development and Cooperation (SDC).

Contents

Introduction

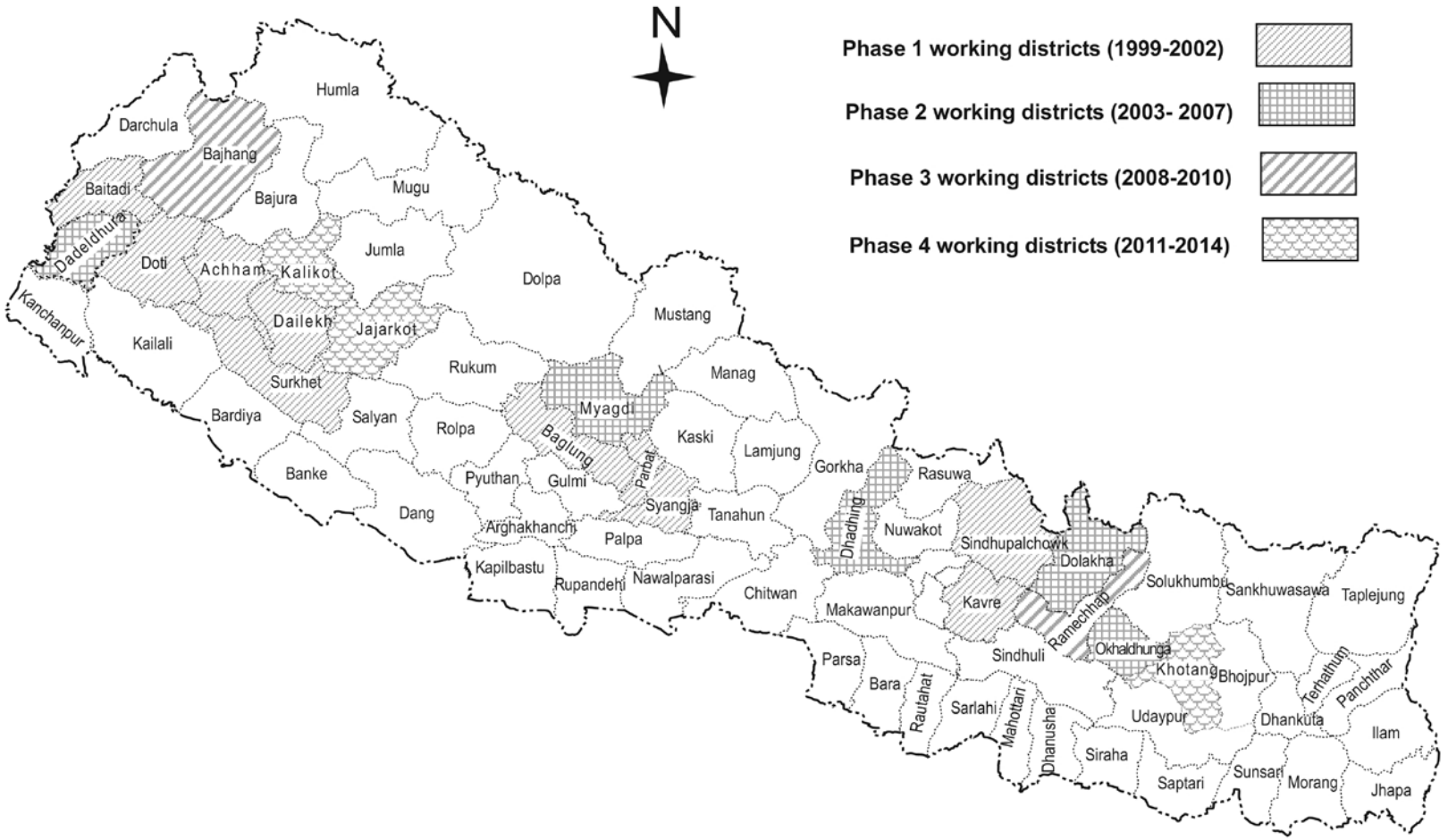
The Sustainable Soil Management Programme (SSMP), funded by the Swiss Agency for Development and Cooperation (SDC), and implemented by HELVETAS Swiss Intercooperation Nepal was launched in 1999 to combat the decline in soil fertility and productivity in the mid-hills of Nepal; at the time of writing, it is now in its 4th Phase and 14th year, and will terminate on 31 December 2014.

Throughout its implementation, the programme has worked in close collaboration with Government bodies and Agencies at central, district and Village Development Committee (VDC) level, and with local NGOs and farmers.

SSMP has promoted proven and appropriate soil management technologies, very largely based on local resources, to mid-hill farming households with the aim of improving soil fertility and productivity, providing alternative cropping options, and increasing the opportunities for food security and a cash income - and thereby enhancing livelihoods. The first part of this booklet covers the 16 major technologies that assist in sustainably improving soil fertility, crop diversity, food security and livelihoods.

Employing a distinctive combination of approaches, the programme has increasingly over the years focused on discriminated and poor farmers, and promoted a decentralized and participatory agricultural extension system known as the Farmer-to-Farmer Approach, based on social and gender equity. In the last two phases, since 2008, SSMP has further concentrated on decentralizing decision making and responsibility for local agricultural development and extension, first to the Districts, and subsequently to the VDCs, the lowest rung of government administration in Nepal. The second part of this booklet describes those approaches that have brought service delivery much closer to those farmers residing in the more remote areas of the projects where SSMP has focused its operations.

SSMP Operational Districts (1999-2014)



Note: SSMP worked in some districts in more than one phase: the map records the phase during which work was begun in each district

PART 1

SSM Technologies

Technology # 1: Improved Management of Farmyard Manure (FYM)

Technology in brief

This technology involves the whole management chain for improved FYM in a five step programme: i) careful collection, layering, and moistening, ii) shading heaps from sunlight to minimize N-volatilization, iii) protecting heaps from rainfall to minimize leaching and erosion, iv) immediate mixing with soil after taking FYM to the field, and v) the systematic collection and use of cattle urine as liquid fertilizer and preparing urine-based botanical pesticides.

Materials and costs

Shading can be provided by a simple roof: dry grass thatch, straw, vine crops or other leaf litters with a simple structure using bamboo or wood available on or near the farm. Some farmers use stone walls and zinc sheets (tin) for roofing, based on the availability and funds available. Costs depend on the materials use and the size of the herd, ranging from NRs 1,500 to 5,000

Climatic requirements and adoption

This technology is applicable in mountains, hills, and Terai and has been promoted up to 2,000 masl, and from small to commercial farmers. The package has been adopted by over 100,000 farmers and adoption is occurring beyond the project districts.

Benefits from the technology

SOCIO-ECONOMIC BENEFITS:

- on-farm monitoring has shown that N content in traditionally managed FYM ranges from 0.5 to 0.7%. Through this technology, the N content in FYM can be increased and then maintained at between 1 to 1.5%. Improved management techniques add a significant portion of N (6-8 kg N/cattle/year) in available FYM which would otherwise be lost through volatilization and leaching,
- increased crop yield,
- reduced costs on mineral fertilizers,
- the well decomposed FYM is lighter and more convenient for transportation to the fields, and reduces work load significantly in operations concerned with storing, carrying to the field and mixing into the soil,
- systematic management of FYM also improves the sanitation around the home,
- enhances social prestige as adopting farmers seen as progressive farmer.

ENVIRONMENTAL BENEFITS:

- this technology significantly minimizes losses of N from the farmyard manure during housing and storage (mainly from ammonia emissions), and following land spreading (mainly from ammonia emissions and nitrate leaching),
- the great majority of farmers insist that application of improved FYM significantly improves physical soil characteristics

Notes: During the dry period (Feb-May), it is recommended that cattle urine is incorporated into the FYM heap (rather than collecting it separately) to ensure proper moistening. During the rainy season, proper drainage should be provided to avoid run in to the heap. Farmers participating in SSMP have adopted this technology more than any other.

Shading FYM heaps from vine crops, Okhreni, Ramechhap, 2009

Well kept FYM, Prem Naisa Amarbhumi, Baglung, 2009

FYM Collection & storage under well thatched roof

Technology # 2: Improved Cattle Shed to Enhance Efficient Urine Collection and use

Technology in brief

This technology involves the redesign and improvements in the cattle shed with the focus on making the floor slightly sloped and as impermeable as possible - e.g. with cement (expensive and durable), stone slabs, soil compaction, or clay (cheap but not durable) with a drainage ditch to lead the urine to a covered collection pit which can be a submerged plastic drum, cement tank, or earthen pit lined with plastic sheet; this is preferably constructed at the lowest point inside the shed, or second option, outside the shed with the urine being drained into the storage tank via ditch, channel or pipe. Pits outside the shed need to be protected from evaporation, rain and runoff.

Materials and costs

Redesigning the cattle shed requires mostly local materials (stone, gravel, sand etc.). For urine storage, a cemented tank is most popular and longest lasting. Alternately urine can be collected in earthen pits lined with plastic sheets, plastic drums or other unused pots. The size and thus cost depends on the number of cattle, the size of shed, the materials used and material availability. For a shed accommodating 3 to 4 cattle, a cemented floor of 5 x 2.5m2 is required, plus a feeding manger at 0.5m height, plus a 0.5 m3 cemented urine collection tank (500 liter); construction costs total NRs 10,000-15,000 but costs are reduced if local materials are used as much as possible.

Climatic requirements and adoption

This technology is applicable in mountains, hills and Terai, and has been promoted to small to commercial farmers up to 2,000 masl. The package has been adopted by over 30,000 farmers. DoA has initiated a programme to support 10,000 such improved sheds in 40 hill district in fiscal year 2013/2014.

Benefits from the technology

SOCIO-ECONOMIC BENEFITS:

- of the nitrogen excreted by cattle, 60% is found in the urine and only 40% in the manure. A household with two cattle can save a significant amount of fertilizer; by collecting urine and adopting improved FYM management techniques on-farm is roughly equivalent to purchasing 100 kg of urea annually,
- the collected urine can be used as liquid fertilizer, and a base for the preparation of botanical pesticides and plant tonics,
- enables easier shed management and cleaning,
- enables efficient handling of forage/fodder/feeds and improves livestock health,
- adds social prestige as farmer is seen as progressive,
- reduces expenses on chemical fertilizers and pesticides.

ENVIRONMENTAL BENEFITS:

- majority of N (as much as 97%) is excreted in the form of urea in the urine and is highly volatile. N losses from urine can occur quickly, and is much higher than from cow dung. Systematic and efficient urine collection reduces the loss of fertilizer value and ammonia emissions to the environment,
- enables organic production.

Notes: Constructing cemented floor and urine collection tank requires an initial investment, and small farmers need support at the beginning. Alternately, farmers can use their own resources to adopt the cheapest and simplest form of urine collection - a compacted sloping floor and a collection pit within the shed. This allows the farmer to see the benefits of collecting the urine and will encourage them to invest in more expensive materials to improve the efficiency of urine collection at a later stage.

Cattle shed with stone paved floor and urine collection gutter, Okhaldhunga, 2007

Cattle shed improvement through construction of new sloping floor, feeding manger and urine collection tank, Ramechhap, 2012

Well managed FYM and urine collection, Moti Bdr. Saru Magar Chisapani Ramechhap, 2013

Specification of the floor area, manger, urine collection tank of the improved cattle shed

Covering slab for the urine collection tank 0.1 m to cover all of the length and width of the tank.
S = SMALL, accommodating 2 to 3 cattle; M = MEDIUM, accommodating 4 to 5 cattle; L = LARGE, accommodating > 5 cattle.

Aspect	Length (m)			Width (m)			Urine Collection Tank Depth (m)			Maximum Urine Storage Volume (liters)		
	S	M	L	S	M	L	S	M	L	S	M	L
Floor	5	6	10	2.5	2.5	2.5	x	x	x	x	x	x
Feeding manger	5	6	10	0.5	0.5	x	x	x	x	xx	xx	xx
Urine collection tank	0.6	0.75	1	0.5	0.75	1	0.5	0.6	1	150	340	1,000

A. Materials, labour and other costs for construction of the improved cattle shed (as in table A)

i) for Cemented Floor

Particular	Materials / labour	Unit	Quantity			Cost (NRs)		
			S	M	L	S	M	L
Cattle shed floor, feeding manger and urine collection tank	sand	sack	12	28	30	1,200	2,800	3,000
	pebble	sack	-	21	-	-	-	-
	cement	sack	4	7	10	3,800	5,600	9,500
	stone	doko	25	40	60	2,500	4,000	6,000
	skilled labour	person day	2	3	3	1,000	1,500	1,500
	unskilled labour	person day	4	4	7	1,400	1,400	2,450
					Total Cost	9,900	15,300	22,450

ii) for Stone Paved Floor

Particular	Materials / labour	Unit	Quantity			Cost (NRs)		
			S	M	L	S	M	L
Cattle shed floor, feeding manger and urine collection tank	sand	Number	8/12 doko	10/15 doko	22/30 doko	2,000	2,500	5,200
	pebble	sack	x	x	x	x	x	x
	cement	sack	1	2	3	950	1,900	2,850
	stone	doko	x	x	x	x	x	x
	skilled labour	person day	1	1	2	500	500	1,000
	unskilled labour	person day	5	6	9	2,000	2,400	3,600
					Total Cost	5,450	7,300	12,650

Note: The materials and labour costs mentioned here describe sheds in Ramechhap, Khotang, Okhaldhunga and Dailekhconstructed in 2012/2013 – costs differ significantly depending upon conditions such as availability and local costs of materials, transportation costs, and wage rates.

B. Additional N saved from improved FYM management and cattle urine collection

# of Cattle	N From Cattle Dung				From Cattle Urine			
	Dung production/ year	N Gain/year		Additional N gain with improved management techniques	Amount of urine can be collected / year *	N Gain/year		Additional N gain from systematic urine collection
		with traditional practice	with improved practice			without systematic collection	with systematic collection	
1 Mature Cattle	1825 kg	15 kg	21 kg	6 kg	1460 L	4 kg	16 kg	12 kg

* It is estimated that an average 4 liters urine/day can be collected from a mature cow/buffalo

Improved cattle shed to ease urine collection, Baglung, 2010

Urine collection pits established near the cattle shed, Baglung 2010

A farmer inspecting urine collection tank, Okhaldhunga 2012

Technology # 3: Urine Based Bio-pesticides for Managing Crop Insect Pests

Technology in brief

This technology involves the preparation and use of bio-pesticides on-farm as follows; i) different plants with pesticidal properties (e.g. repellant, anti-feedant, toxicants, growth inhibitor) are collected and chopped into small pieces, ii) materials like ginger powder, green chili, ash, and mustard cake are mixed with the chopped plant material, iii) the material is placed in a plastic drum or earthen pot and soaked in cattle urine at the rate of about one kilogram of solid material per 2 liters of cattle urine, iv) the drum is closed as air-tight as possible and put in a shady place, v) the mixture is stirred with a wooden stick once a week, and vi) the prepared pesticide is normally ready for field application after about 21-40 days. The pesticide is diluted with water normally 1:4 (1 part pesticide solution: 4 parts water) for mature plants and 1:8 for nurseries; and is applied with a jug, sprayer, or broom and applied at 3 to 7 days interval. The dilution and the spraying intervals largely depend on the crop growth stage and the intensity of any insect pest infestation.

Materials and costs

Various plants including Titepati (mugwort), Sisno (stinging nettle), Khirro (tallow tree), Banmara (crofton weed), Neem, Bakaino (china berry), Ashuro (malbar tree), Ketuke (century plant), Patina (field mint), Garlic, Chili, and Ginger are used depending upon local availability. In general, herbs and plants that are bitter, pungent, 'hot' or that produce a strong odour are most effective for preparing botanical pesticides. Farmers generally use 30 to 60 litre plastic drums for preparing pesticides. Average investment for the preparation of 30-60 ls of bio-pesticide ranges from NRs. 500 - 1,000, which includes cost of drum and labour.

Climatic requirements/adoption

Botanical pesticides can be prepared and used from the terai to the hills and mountains and is effective against several insect pests. At low temperatures, the fermentation process takes longer. The technology has been adopted widely in Nepal and is popular among organic and small scale commercial vegetable growers.

Benefits from the technology

SOCIO-ECONOMIC BENEFITS:

- effective against several insects like aphids, red ants, white grubs, flies, thrips, borer, beetles and diseases caused by fungi (eg. blights, damping-off, wilting etc.),
- reduced expenditure on agrochemicals – eg. pesticides,
- decreased pest incidence,
- improved crop health due to additional fertilizer from urine,
- allows organic production of crops,
- low-cost, and uses the traditional knowledge of farmers.

ENVIRONMENTAL BENEFITS:

- reduces the application of potentially harmful chemical pesticides,
- reduces the risk of water contamination by chemical pesticides,
- improves soil biological health.

Notes: botanical pesticides are most effective as a preventative measure – ie. when applied before insect/pest/disease outbreaks or in the early stages - and when combined with other regular IPM techniques. It is a promising option for alternative insect pest management, but further research studies on effectiveness are required to standardize preparation and application norms. Some entrepreneurial farmers sell botanical pesticides.

Demonstration of materials and process for preparing bio-pesticides, Baglung, 2009

Bio-pesticides prepared in plastic drums

Farmers applying a bio-pesticide to vegetable crops,
Okhreni, Ramechhap, 2012

Technology # 4: On-farm Composting to Improve Soil Fertility

Technology in brief

This technology is close to and derived from traditional practices and relies on using locally available materials. On-farm composting is very helpful for producing plant nutrients for farmers who own few or no livestock, do not have enough FYM, or have scattered fields often far from the home. Compost can be prepared in a pit, semi-pit or in heaps. The pit method involves: i) digging a 1-2m diameter and 1m deep pit using a spade or shovel; ii) collecting crop residues, grasses, tree leaves, and animal urine; iii) putting the materials in the pit, adding a little lime, ash and any other starter such as effective microorganisms (EM) to accelerate the decomposition process; v) adding more tree leaves, crop residues, and grass until the pit is full; vi) covering the compost heap with a fine layer of mud and a cap of grass or straw or plastic sheet; vii) turning the compost every 30-50 days depending on the mix and the outside temperature. The compost will be ready after 3-6 months depending upon the materials used and the location. Compost prepared in a semi-pit or heap employs the same preparation techniques. In addition, cattle dung and organic waste from the farm or household can be used to produce vermi-compost.

Materials and costs: on-farm composting requires almost no external materials; on-farm crop residues (stubble/stalk/straw), grasses, tree leaves, forest litter plus some starter material like forest soil or FYM are most commonly used. Establishment costs depend upon the size and number of compost pits and availability of the materials near the farm. In general, NRs. 600 - 1000 is required for establishing a pit (1m diameter and 1m depth) which includes labour costs for digging and collecting materials.

Climatic requirements and adoption

On-farm composting is applicable in the terai, hills and mountain (100 - 2,000 masl) and small to larger farmers. At higher altitudes, availability of composting materials may be less, and composting takes a longer time because of the low temperatures.

Benefits from the technology

SOCIO-ECONOMIC BENEFITS:

- reduces expenditure on agrochemicals (eg. fertilizers),
- reduces transportation cost,
- allows organic production of crops,
- low-cost and uses the traditional knowledge of the farmers,
- in-field composting reduces the carrying workload,
- makes good use of waste materials, improves soil fertility and increases crop yields.

ENVIRONMENTAL BENEFITS

- reduces the application of chemical fertilizer,
- as crop residues, grasses and leaf litter are used, on-farm burning of these materials is reduced, thereby decreasing on- farm CO2 emissions,
- improves soil physical, biological and chemical properties and hence enhances soil fertility and productivity.

Notes: Farmers who have livestock and produce FYM do not need to dig the compost pit nearby the cattle shed, and household waste can be mixed with the FYM. In general, composting should be done in the fields where it will be applied to reduce the workload carrying the material. However for farmers who have biogas, it is better to prepare compost with the slurry rather than mixing it with the FYM.

On-farm composting by covering black plastic sheet (heap method), Dolakha, 2009

A simple method of in-field composting, Amarbhumi, Baglung, 2009

A farmer collecting compost, Lapilang, Dolakha, 2010

Technology # 5: Inclusion of Legumes in the Cropping System to Increase Farm Productivity

Technology in brief

Legumes are widely grown across the hills and terai of Nepal, with the most common being soybean, lentils, chick pea, black gram, cow pea, various beans, horse gram, field peas, and rice bean. They are mostly intercropped or relay cropped with cereals such as maize, millet, and rice. They are also planted on terrace edges and rice paddy bunds. Depending on the species, they may be grown in rain-fed or irrigated fields during both winter and summer seasons. Legumes are grown for grain, vegetables, soil improvement, as green manuring and cover crops, for forage and to generate income. Depending on the type of farm niche, legume crops are planted in various ways - broadcasting, line sowing, or spot planting.

Materials and costs: it is generally easier to grow legumes than other crops. Many legume crops do not need much land preparation, can often grow on residual soil moisture and poor soil nutrient conditions, and can withstand adverse climatic conditions like drought. The major cost involves seed purchase and minimum land preparation. Legumes grown for vegetables often need staking eg. beans, cow peas. Depending upon the purpose, variety and cost of seed, the cost for establishing a legume crop ranges about NRs. 1,000 to 5,000 per ropani.

Climatic requirements and adoption

Legume crops can be grown in wide climatic conditions from terai to hills and mountains (>2,000 masl) and under irrigated or rainfed conditions. The value of integrating legumes in a cropping system is well understood by most farmers and about 80% of farmers participating in SSMP have adopted legumes. It has also been adopted by farmers who have not directly participated in SSMP activities, but have learnt from their neighbors and peers. While this is not a new technology, farmers now consciously plan a legume crop for improving soil conditions and fertility.

Benefits from the technology

SOCIO-ECONOMIC BENEFITS:

- inexpensive technology requiring less agronomic expertise e.g. minimum or zero tillage, little care or fertilizer requirement,
- reduced expense on nitrogen fertilizers,
- additional high value (source of cash income) and nutritious crop (important protein provider),
- nutritious livestock fodder.

ENVIRONMENTAL BENEFITS

- reduces application of N fertilizer as legumes fix atmospheric N in root nodules,
- reduces soil erosion through providing extensive vegetative cover and a deep root system (e.g. cow pea, beans, horse gram, rice bean),
- increases organic matter in the soil,
- improves soil physical and biological characteristics.

Notes: legume crops do not respond to N-fertilizer and often perform poorly in soils with excess N or susceptible to water logging. To increase the soil organic matter, the biomass should be incorporated into the soil or used as livestock forage. Traditional practices of harvesting legume crops should be avoided (e.g. uprooting the plant and burning the biomass).

Farmer Jaba Kanya Rai tending her beans in Baruneshwor, Okhaldhunga District, 2011

Farmer Kamal Saud, with his bean crop, Dadeldhura, 2009

Technology # 6: On-Farm Production of Fodder/Forage

Technology in brief

Fodder and forage plants play a major role in the crop-livestock-manure-soil nutrient cycle on farms in the middle mountains of the Himalayas. Livestock convert fodder shrubs and grasses from the forest, crop residues, and other fodder into manure through digestion. However, in the middle hills of Nepal, the lack of availability of good quality fodder often limits not only the productivity of livestock, but also the nitrogen content of animal dung if, for example, only cereal crop residues are fed to the animals. On-farm fodder or forage production involves the growing of trees, shrubs, grasses and other species as an agroforestry practice in various locations – eg. on waste land, farm and home garden boundaries, stream banks, terrace risers, and in rotation with a main crop or in a dedicated plot.

Materials and costs

Several fodder species like Badahar, Bakaino, Nimaro, Khannue, Rai Khannue, Khirro, Kutmiro, Kadam, Ipel-Ipel, Amriso, Tanki, Koiralo are popular among farmers. For forage; legumes, Oat, Berseem, Stylo, Vetch, Desmodium, Napier and several other species are grown. Cultivation costs for forage crops range between NRs. 500 and 1,000/ropani, including seed costs and minimum cultivation practices. For establishment of fodder crops, the cost depends on the availability of seedlings, saplings, nursery raising and planting requirements.

Climatic requirements/adoption

A wide range of fodder and forage species are available and different species can be grown from the humid tropics to the hills (circa 2,000 masl). About 30% of farmers participating in SSMP have adopted this technology, and produce fodder and/or forage on their farms.

Benefits from the technology:

SOCIO-ECONOMIC BENEFITS:

- improves the availability and quality of fodder,
- improves health and production of livestock,
- it is an inexpensive technology, which makes good use of under-used or waste land (e.g. terrace risers, field boundaries, and stream banks),
- improves the quality of FYM,
- increased fodder availability near the house and on-farm reduces women's workload for collecting fodder and grass feed for livestock,
- incorporation of multi-purpose tree species on farmland provides several side economic benefits like timber, wood, fruits along with improved livestock fodder.

ENVIRONMENTAL BENEFITS:

- encourages stall feeding of livestock thus reducing the need for free grazing,
- reduces the pressure on forest for supply of fodder and forage,
- increases the availability of organic inputs into the soil,
- reduces soil erosion from terrace bunds and marginal lands.

Notes: growing fodder/forage on farmland with cereals, cash and vegetable crops is a traditional practice among Nepalese farmers. However, with the increasing pressure on land for crop production and continued fragmentation of land, the on-farm production of fodder and forage has been declining. Availability of seeds, seedlings, saplings is often poor in remote areas - farmers need support in species selection, coaching in nursery preparation and management, and in care of trees (eg. pruning), and some financial support for seeds and planting materials.

Farmer Sushila Bahadari with her forage crop (Oat), Hatiya-3, Baglung, 2010

On-farm fodder/Forage production, Tilpung, Ramechhap, 2013

A farmer with her forage crop grown on terrace risers, Okhaldhunga, 2010

Technology # 7: Promotion of Green Manuring to Improve Soil Fertility and Productivity

Technology in brief

Green manuring is generally practiced in 2 ways- i) growing green manuring crops (mostly legumes) in the fields either as sole crop or mixed or relayed with the main crop and mixing it into the soil in early stages of growth (mostly at tender stage and before flowering); or ii) collecting leafs or whole tender plants from farm or off-site, chopping and mixing it into the soil. In irrigated lands where rice is a main crop, green manuring crops like Sanai, Dhaincha are grown before rice and incorporated into the field during land preparation for rice transplanting. Green manure crops are generally grown for a short duration, usually 1-2 months depending upon the type of crop and time availability for growing such crops.

Materials and costs

Growing green manure crops need minimum tillage operation and can often be grown under zero tillage conditions. The major costs relate to seeds and for incorporation of the green manure into the soil - and where green manure is collected from fields or off-farm sites, the cost for collection and incorporation. For green manuring, the following are most commonly grown: beans, cowpea, Sanai, Dhaincha, hemp are grown; the green leaves and tender branches of plants like Titepati, Ashuro, Khirro, and Banmara can also be collected and incorporated into the soil as green manures.

Climatic requirements/adoption

green manure crops have been mostly adopted by terai farmers where reliable irrigation facilities are available and rice is the main crop. However, common mid-hill practices include: legumes being grown with the maize (a mixed or relay crop), and then incorporated into the soil; the collection of green leaves/tender plants from on-farm or off-farm sites which are then incorporated into the soil. At higher altitudes, green manures are not very applicable because of low temperature, longer crop duration and slow decomposition of organic matter into the soil.

Benefits from the technology

SOCIO-ECONOMIC BENEFITS:

- adds organic matter into the soil which improves soil fertility and productivity,
- reduces chemical fertilizer inputs,
- increases production,
- a sensible, low cost use of available green matter.

ENVIRONMENTAL BENEFITS:

- reduces the use of chemical fertilizer,
- legume crops fix atmospheric N into the soil,
- green manure crops cover the soil surface thus protects soil structure and reduces soil loss from erosion,
- green manure crops utilize residual soil moisture and nutrients,
- off-site soil nutrients are cycled into the farm field,
- improves soil physical and biological properties.

Notes: increasing cropping intensity, limited irrigation facilities, complexity of the farming system and practices of feeding crop residues to the livestock are some of the factors limiting adoption of this practice. However many farmers are adopting green manuring practices by either collecting green materials from off-farm sites or by growing legumes as a mixed or relay crop.

A green manuring practice observed in a farmer's field, Dailekh, 2011

Growing legumes as a green manure in between rows of maize, Kavre, 2009

Technology # 8: Integrated Plant Nutrient Management

Technology in brief

Integrated plant nutrient management system (IPNS) is a holistic approach, which integrates crop management with soil and plant nutrient management so as to improve soil fertility and achieve higher crop yields.

Aspects that are taken into account include soil structure, moisture levels, balancing pH, soil microbiology, enhancing organic matter levels, plant nutrient availability and potential losses, integrating legumes, erosion risks and reduction, type of crop, crop planting time and method, crop density, protection, crop rotation, and estimation of crop nutrient requirements and production.

The major objectives of the plant nutrient management system includes sustainable soil management, improvement in crop production and productivity, optimum efficiency from the use of organic and inorganic plant nutrients and minimizing adverse impact to the environment.

Materials and costs

This system involves the preparation and optimum use of locally available farm resources such as farm yard manure, compost, cattle urine, the incorporation of crop residues into the soil, as well as sound crop management practices such as rotating crops with legumes, estimating the soil nutrients available for the crop, estimating crop nutrient requirements and adding external nutrients to achieve optimum production. This practice often reduces the costs for external inputs and increases the efficient use of locally available resources often available free of cost.

Climatic requirements/adoption

The farmers' field school (FFS) approach can be adopted to disseminate the concept of plant nutrition management amongst farmers with small land holdings in the mid-hills ranging from 1200-1600 masl. This system is practiced in various cropping systems based on maize, rice, millet, wheat, and vegetables.

Benefits from the technology

SOCIO-ECONOMIC BENEFITS:

- reduces the external inputs for crop production,
- increases crop production (results from the 54 farmer field experiments have shown a 25 to 30% increase in crop yield),
- efficient use of locally available farm resources.

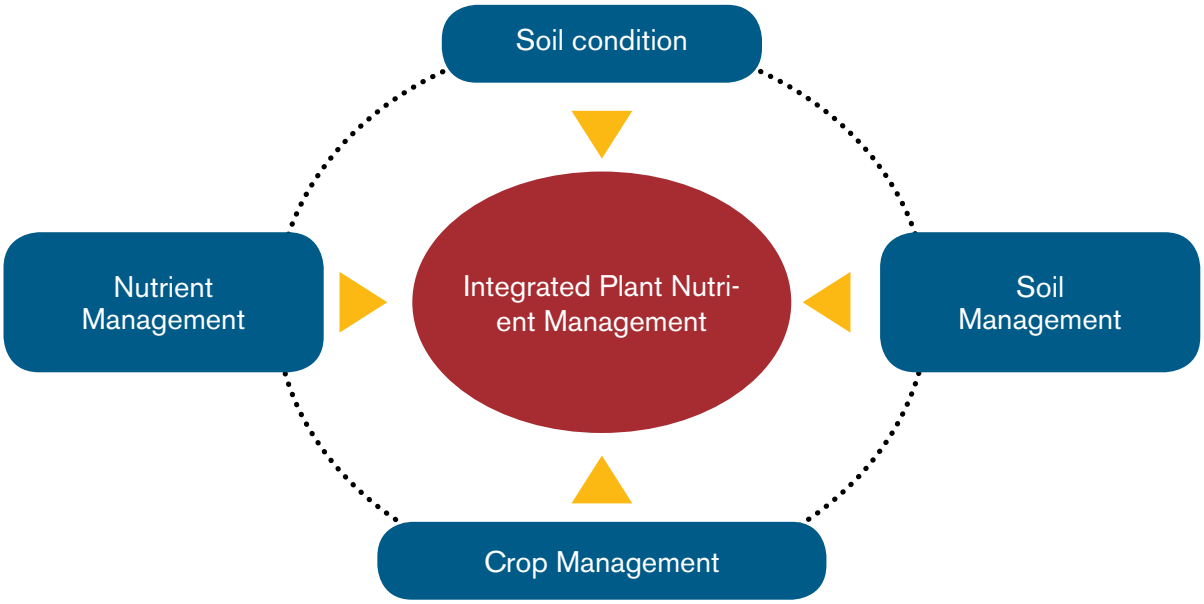
ENVIRONMENTAL BENEFITS:

- reduces use of chemical fertilizer,
- enables sustainable crop production,
- more efficient use of plant nutrients which reduces losses through leaching or emissions into the atmosphere.

Notes: Farmers have been practicing this system in one or other simple way for a long time. However, the estimation of available soil nutrients for the crop, the crop nutrient requirement and calculation of the nutrients added through organic sources are quite complicated and difficult for both farmers and extension workers. If a simple IPNS calculator for major crops is available to the farmers for the different agro climate zones and crops, this would be very helpful in promoting this system to a wider audience.

Vegetables grown under IPNS, Suri VDC, Dolakha, 2009

IPNS experiment on citrus orchard, ARS Dailekh, 2013



MAJOR COMPONENTS TO BE CONSIDERED FOR IPNS

Technology # 9: Low-cost Polyhouse Tomato Production during Rainy Season

Technology in brief

This technology involves the construction of a simple low-cost polyhouse by attaching a polythene sheet to a bamboo frame using string, rope, sometimes nails and wire, for protecting the crop from intense rainfall during the June to September monsoon season. The size of the polyhouse varies widely and depends upon the purpose for which they are being erected, and in many cases in the mid-hills, the availability of suitable space on the smallholder farms: they can be categorized as a) small: 10 m x 6 m); b) medium: 15 m x 6 m; and c) large: 20 m x 6 m. The above ground height of the structure varies depending on the altitude as follows: the above ground height of the center and side poles should be 3.6 and 2.6 m at ~1000 masl, 3 and 2 m at 1000-1600 masl, and 2.5 and 1.6 m at 1600-2000 masl respectively. 20-25 day old tomato seedlings are planted in mid-May to early June with a row to row spacing of 90 cm, and a plant to plant spacing of 60 cm for an open row system; for a closed row system RxR and PxP spacing can both be 60 cm. Regular pruning, training and staking is essential to produce a good quality product.

Materials and costs

The materials required include bamboo for the frame, a plastic sheet for the roofing, ropes and nails to construct the polyhouse; for the tomato crop, good quality healthy seedlings of the correct variety, sufficient well decomposed FYM/compost, and bamboo sticks and string for staking are needed. The cost also varies depending upon the size of polyhouse, the quality of the plastic, and the cost of seed and labour. The cost for establishing polyhouse with better quality plastic ranges from a mean of NRs. 12,000 for a 60 m2polyhouse, to NRs. 18,000 for one of 100 m2.

Climatic requirements/adoption

This technology is suitable for altitudes ranging from 1,000 to 2,000 masl, altitude range of 1,200 to 1,800 being most suitable for better quality tomato production during rainy season. This technology is gaining popularity among the farmers in mid-hills because of the suitability of the technology in this afgro-zone and the good income that can be earned.

Benefits from the technology

SOCIO-ECONOMIC BENEFITS:

- increases farm income, earning NRs. 15,000 to 20,000 net income from a 100 m2 polyhouse per season,
- improves food security,
- low-cost and simple technology, and occupies little land,
- enables off-season production,
- helps to reduce seasonal migration.

ENVIRONMENTAL BENEFITS:

- reduces hazards like heavy rainfall, drought
- helps to reduce soil loss

Notes: regular inspection of the crop is very important, as the tomato crop is prone to blight especially in enclosed spaces; to break the disease cycle, crop rotation is necessary, and the site should be changed every 3 years. There is a high market demand for tomatoes during the rainy, and especially near the autumn festivals they fetch a good price.

Tomatoes grown under low-cost polyhouse, Chisapani, Ramechhap, 2012

A farmer inspecting his tomatoes grown under polyhouse, Okhaldhunga, 2011

Farmers selling tomatoes produced in polyhouse, Manthali, Ramechhap, 2012

Technology # 10: Ventilated Polyhouse Technology

Technology in brief

Ventilated polyhouses are a slight modification of the normal low-cost polyhouse above; an open space, of between 0.3 and 0.5 metre, is provided at the top of the polyhouse to improve air circulation. This air circulation helps to regulate the inside temperature and humidity, which helps to reduce the incidents of fungal diseases. The establishment and cultural practices are the same as in the normal polyhouse.

Materials and costs

The materials required include bamboo for the frame, a plastic sheet for the roofing, ropes and nails to construct the polyhouse; for the tomato crop, good quality healthy seedlings of the correct variety, sufficient well decomposed FYM/compost, and bamboo sticks and string for staking are needed. The cost also varies depending upon the size of polyhouse, the quality of the plastic, and the cost of seed and labour. The cost for establishing polyhouse with better quality plastic ranges from a mean of NRs. 12,000 for a 60 m2polyhouse, to NRs. 18,000 for one of 100 m2.

Climatic requirements/adoption

The ventilated polyhouse is suitable for lower altitudes, from 1,000 to 1,400 masl, where temperatures and humidity are high during the rainy season. This type of polyhouse is becoming popular amongst the farmers of Baglung, Syangja, Ramechhap and Khotang districts.

Benefits from the technology

SOCIO-ECONOMIC BENEFITS:

- increases farm income, earning NRs. 15,000 to 20,000 net income from a 100 m2 polyhouse per season,
- improves food security,
- low-cost and simple technology, and occupies little land,
- enables off-season production,
- helps to reduce seasonal migration.

ENVIRONMENTAL BENEFITS:

- reduces risks from heavy rainfall and drought,
- helps to reduce soil loss.

Notes: regular inspection of the crop is very important, as the tomato crop is prone to blight especially in enclosed spaces; to break the disease cycle, crop rotation is necessary, and the site should be changed every 3 years. There is a high market demand for tomatoes during the rainy, and especially near the autumn festivals they fetch a good price.

The increasing rural road networks have added opportunities for marketing – in many cases it is now possible to supply the markets in the district headquarters, other regional markets, towns in the terai and even the adjacent Indian markets.

The technology provides the scope for commercializing small farms and generating a significant employment and income opportunity to smallholder farmers, thereby contributing towards livelihood improvement. With a careful watch on any emerging over-supply situation, smallholder farmers can be encouraged to promote this technology, especially those with limited land. Alternative crops for the winter can be identified for production in the January to June period (eg. herbs, spices, early seedlings and cucumber).

Tomato crop under ventilated polyhouse, Amarbhumi, Baglung, 2010

Farmers harvesting tomato, Amarbhumi, Baglung, 2010

Technology # 11: Seasonal/Off-season Vegetable Promotion

Technology in brief

This technology involves the promotion of marketable seasonal and off-season vegetables linked with the SSM packages. The traditional cropping system is changed to allocate dedicated plots for production of various vegetables, for example cabbage, cauli, tomato, beans, peas, chillies, cucurbits and others. Farmers often grow the vegetables as an inter-crop between their fruit trees, and are often rotated with cereal crops.

Materials and costs

The cost varies depending upon the area planted, the target production level, the type and variety of vegetable, the length of growing season, and whether it is grown as a seasonal or off-season crop. In general, off-season production needs more intensive care and management as compared to seasonal production. The costs include land preparation, seed, and small tools. If the vegetables are grown in a polyhouse, costs will include polyhouse construction and initial production costs will be more. However, growing vegetables is a lucrative business, generates household income and is a growing sub-sector in agriculture.

Climatic requirements/adoption

Because of the diverse agro-climatic niches in Nepal, a wide variety of vegetables can be grown in the mid-hills, which are especially suitable for off-season vegetable production during the summer rainy season. The increasing demand for vegetables, the changing habits in food preferences, and the increasing rural road network have created greater scope for the growth of this sub-sector.

Benefits from the technology

SOCIO-ECONOMIC BENEFITS:

- enables higher income per unit area as compared to cereal crops - small holder farmers are able to earn NRs. 20,000/year from 1 ropani under vegetables in the midhills,
- demand for fresh vegetables is increasing,
- marketing is easier due to the improving rural road network, communication and expanding urban centers,
- government policies and programmes have been prioritizing this sub-sector,
- improved household food security,
- provides employment and income opportunities
- helps to retain the male members in the villages through providing employment and income.

ENVIRONMENTAL BENEFITS:

- when linked with SSM practices, it is a sustainable production system,
- reduces chemical inputs,
- SSM practices enable organic production system.

Notes: vegetable production is a growing agro-business in Nepal and provides moderately rapid household cash income. To establish a sustainable production system is a challenge for Nepalese farmers – e.g. maintaining soil fertility, crop protection and marketing. Adoption of SSM practices, rational use of agro-chemicals and planned production are thus very important to achieve business success. Farmers often need knowledge and coaching on post-harvest practices – e.g. cleaning, grading, storing and packaging, and minimizing losses during transportation.

A farmer with her vegetable crop,
Jagdipur, Jajarkot, 2013

Farmer preparing Vegetable for market,
Okhaldhunga, 2013

Farmers selling their produce at local haat bazar, Okhaldhunga, 2013

Technology # 12: Promotion of Cash Crops

Technology in brief

Technology in brief: this technology involves the production of crops which can be sold for a cash income; these include ginger, turmeric, chilies (akabare and others), garlic, and onion, and are best grown where SSM practices have been adopted for crop enhanced production. These crops can be grown on dedicated plots or rotating or mixing with cereal crops. Cash crops are also grown in orchards where the fruit trees are well established.

Materials and costs

The cost varies depending upon the area of land planted, the targeted level of production, the type and variety of the crop, and the length of the growing season. The major costs are associated with seed/planting material, land preparation, labour charges, small tools, and crop protection. Growing cash crops can be a lucrative business for the generation of household income.

Climatic requirements/adoption

Because of the diverse agro-climatic niches in the mid-hills, a wide variety of cash crops can be grown. The mid-hills are very suitable for several cash crops like ginger, turmeric, garlic, onion, akabare chili, alainchi. The increasing demand for cash crops and the increasing rural road network are increasing growth in this sub-sector.

Benefits from the technology

SOCIO-ECONOMIC BENEFITS:

- enables higher income per unit area as compared to cereal crops
- high demand – large volumes of the most common cash crops are imported from India every year,
- marketing is becoming easier due to the improving rural road network, and the increasing number of urban centers,
- government policies/programme have given priority to this sub-sector,
- improves household food security,
- provides employment and income opportunities,
- helps to retain the male members in the villages through providing employment and income.

ENVIRONMENTAL BENEFITS:

- sustained production system when linked with SSM practices, which reduces chemical inputs,
- SSM practices enables organic production systems,
- enables higher production and use of waste lands even in dry periods,
- generally a low cost technology,

Farmer Radhika Sapkota with her ginger crop, Adhikari Chaur-9, Baglung, 2009

Farmer Misri Moktan with her Akabare chili crop, Bhirkot, Dolakha, 2010

Farmers selling their cash crops, Diktel, Khotang, 2013

Technology # 13: Raising Seedling inside Poly Tunnels

Technology in brief

Nursery tunnels are a miniature form of the polyhouse, and are used for either forcing vegetables or protecting seedlings from adverse climatic conditions. During the monsoon, such tunnels are partially covered with transparent white plastic sheet to protect the seedlings in the nursery from high rainfall. During winter where low temperature is the limiting factor for seedling growth, these tunnels are covered completely to protect from ambient cold temperatures.

Materials and costs

The materials required are bamboo or wood for the frame, plastic sheet for roofing, and string to attach the plastic to the frame. The width of the tunnel is kept at around 1m, standard seed bed width; the length can be according to requirement, usually up to 2 to 3m. For this size of nursery tunnel, the average establishment cost ranges from NRs. 500 to 1500.

Climatic requirements/adoption

Nursery tunnels for producing healthy seedlings are popular among the mid-hill farmers between 1,000 and 2,000 masl. Similar plastic sheet tunnels are also popular among terai farmers for raising seedlings during rainy season.

Benefits from the technology

SOCIO-ECONOMIC BENEFITS:

- enables off-season and early vegetable production,
- produces better quality seedlings which enables better crop production,
- low-cost and simple technology.

ENVIRONMENTAL BENEFITS:

- reduces risk of damage from heavy rainfall, drought and cold,
- reduces the use of chemical pesticides

Notes: raising healthy seedling at the proper time is a common bottleneck in the profitable production of off-season vegetables during the rainy season and the winter. These nursery tunnels are very helpful in producing healthy seedlings and forcing vegetables in time for an early crop and the best market price.

Covered nurseries on the farm of Kala Rai, Buipa VDC, Khotang District, December 2011

A winter nursery for off-seasonal cucumber and summer squash on the farm of Bal Bahadur Dhami, in Binayak, Achham, November 2011

Technology # 14: Tande Nursery

Technology in brief

This technology involves the establishment of a simple farm shed using bamboo and/or wood for frames and poles, and plastic sheet or dry grass for roofing, is used for producing seedlings, usually vegetables - especially during the rainy season. The size depends upon the farmer's requirement and purpose. Most of the structures constructed in Okhaldhunga are 1 to 1.5m wide and 2 to 3m in length. The ground floor is often used for vermicomposting or storing farm equipment.

Materials and costs

The structure needs bamboo or wood and plastic sheet or other locally available roofing material. For vermi-composting, purchase of the earthworms is initially required. The costs depend upon the size of the structure and availability of materials. In Okhaldhunga farmers have built such structures with costs ranging from NRs. 1,500 to 3,000 including labour.

Climatic requirements/adoption

This technology is applicable both in the terai and mid-hills for producing healthy and good quality seedlings and vermi-compost. Producing seedling under plastic shed is a common practice, but such multi-propose sheds are relatively new among the mid-hill farmers.

Benefits from the technology

SOCIO-ECONOMIC BENEFITS:

- a low-cost structure, constructed from locally available materials,
- enables healthy seedling production during the rainy season and enhances timely and profitable off-season vegetable production - in many areas, failure to produce healthy seedlings on time for the rainy season is one a major bottleneck to profitable off-season vegetable production,
- can be used for various proposes (see photos),
- enables quality vermicompost production thus reduces chemical fertilizer inputs – easily available for the seedling beds,
- relatively easy physical activity for seedling production, vermin-composting and handling farm tools, which reduces work load.

ENVIRONMENTAL BENEFITS:

- reduces agro-chemical use in vegetables - vermicomposting enables the proper use of household organic waste and thereby reduces the use of chemical fertilizers.

Notes: this technology makes it easier to produce healthy seedlings on-time in both the hills and terai areas. Tande nurseries are low-cost, labour-saving, and farmer and eco-friendly – it is a technology that needs to be further promoted across the mid-hills especially for those farmers who are focusing on vegetable production.

Farmers learning seed bed preparation and planting on tande nursery, 2013

A farmer working on tande nursery, Okhaldhunga, 2013

Healthy seedling grown on tande nursery under shed, Okhaldhunga, 2013

Technology # 15: Promotion of Improved Cereal Crop Varieties

Technology in brief

this technology involves the combined use of improved seeds of cereal crops and adoption of SSM practices. There are several improved cereal varieties developed and recommended by authorized institutions (eg. NARC). These varieties are better performing and more productive than local variety. The average national yield of maize and wheat is quite low compared to neighboring countries. From the SSMP's farmer field experiments the use of improved seeds and adoption of SSM practices significantly increases the crop yield by 30% or more, as compared to local seeds and traditional farming practices.

Materials and costs

The cost varies depending upon the area of land to be planted, the target production level and the seeds used. Improved cereal crop seeds are often grown and marketed by cooperatives and community-based seed production groups at the local level and can be obtained from the District Agriculture Development Office, research stations and agro-vet outlets. These improved varieties often require higher soil nutrients thus additional fertilizer may be required for optimum yields. In this regard, improved FYM management, green manuring, cattle urine, and legume integration are some of the SSM technologies that can help to improve the soil fertility.

Climatic requirements/adoption

Several varieties of maize and wheat have been recommended and promoted for different agro-ecological zones and conditions. The major improved maize varieties for the mid-hills include Deuti, Mankamana 1,3,4,5 and 6, Khumal, Rampur Composite, Arun-2 condition, Ganesh-1 and 2, Sitala for the higher hills, and several others for terai conditions. For wheat, WK1204, PasangLahmu, Kanti, Annapurna-3 and 4 and several others are recommended for the mid- and high hills depending upon specific agro-ecological conditions. Adoption of improved cereal crop varieties is increasing as several agricultural development projects are supporting farmers with seeds.

Benefits from the technology

SOCIO-ECONOMIC BENEFITS:

- increases production thus improves the food security situation,
- with ssm technologies, it is a sustainable production system,
- low cost technology, requires minimum additional costs specially for seeds

ENVIRONMENTAL BENEFITS:

- some varieties are tolerant against drought and certain pests and diseases,
- better crop growth and cover thus reduces risk of surface erosion,
- often increases crop residues for organic inputs into the soil.

Notes: adoption of improved cereal crop varieties is often poor in more remote areas because seed is not available at the right time – technical and financial support is therefore required for community-based seed production programme, and seed storage facilities. There should also be crop improvement programme for the local varieties which are often popular among the farmers because of certain unique characters such as aroma, cooking quality, taste, easy to harvesting.

A farmer harvesting maize crop (improved), Baglung, 2010

A farmer with her Improved wheat corp, Bruneshor, Okhaldhunga, 2011

Technology # 16: Household Waste Water/Rain Water Collection and Use for Crop Production

Technology in brief

This technology involves the establishment of small earthen ponds/pits of 1m depth and 1 to 2m width, near the home, water tap, and close to the vegetable fields. It is usually lined with a plastic sheet, most commonly Silpaulin, which is strong and durable, although a cheaper locally available plastic can be used. During the rainy season, or sporadic winter rainfall event, run-off water is channeled into the pond through a drainage ditch. For roof water, bamboo gutters or pipes can be used to collect water in the pond. The collected water then can be used for irrigating vegetables/cash crops especially during the winter. This enables farmers to produce high value cash crops or off-season vegetables even in the dry season.

Materials and costs

The cost of the plastic sheet and labour for digging are the major costs for establishing such a pond and this depends on the quality of plastic purchased and the size of the pond. The average cost ranges between NRs. 1,500 to 4,000 for a 1m deep, 2m wide and 3m long pond. If the pond is earthen without plastic the cost will be significantly lower. Additional expenditure may be made for gutter/pipes if roof water is also channeled into the pond – locally available bamboo is best used for this.

Climatic requirements/adoption

This technology is applicable for the terai, mid-hills and mountains, and is suitable for small to medium scale vegetable farmers. It has proven popular among the farmers in Ramechhap, Okhaldhunga, Khotang, and Dailekh.

Benefits from the technology

SOCIO-ECONOMIC BENEFITS:

- enables higher production in dry periods and the use of waste land for the storage,
- low cost technology,
- reduces workload as availability of water nearby home or vegetable field reduces the time for fetching and carrying water.

ENVIRONMENTAL BENEFITS:

- use of waste water,
- reduces the risk of crop loss from periods of drought.

Notes: although many projects and programmes over the years have established ponds and other channel irrigation systems, water availability is still at the top of the farmers list of priorities. In addition, many farmers are often excluded from these programmes, due to geography, isolation or lack of a sufficiently large water source to justify the expense. This technology is especially suitable for such farmers and is adopted by more innovative and commercial-oriented farmers to scale up and enlarge their vegetable farm. It has been promoted in Ramechhap, Okhaldhunga, Khotang, Dailekh since 2010 in different pocket areas where polyhouses are common, vegetable production is high, but water availability is low. These plastic ponds are constructed by the farmers themselves, the only outside material required being the Silpaulin plastic, which is often available at the local agro-vet outlet.

A waste water collection pond at vegetable production site, Baglung, 2010

A bamboo gutter collecting rain from zinc sheet roofing, Okhaldhunga, 2013

Water collection pond lined with a Silpoulin plastic sheet at a vegetable growing farm, Okhaldhunga, 2013

PART 2

SSMP Approaches

Approach # 1: The Farmer to Farmer Extension Approach

Approach in Brief

The Farmer-to-Farmer (FtF) agriculture extension approach is a system which promotes the training of farmers by another more skilled and knowledgeable farmer thus providing a delivery mechanism for imparting and extending new agricultural practices and technologies to farmers,especially those residing in remote areas. The farmers selected to lead "farmer-to-farmer" extension are called many names – e.g. model, master, or lead farmers and are initially selected on the basis of their agricultural expertise. SSMP has termed them Experienced Leader Farmers (ELFs). The MoAD also has a system of Village Agricultural Workers and Village Animal Health Workers, but this is currently poorly funded and supported.

In Nepal, FtF extension provides an effective alternative to public agricultural extension services which are supply driven, less effective, weak, de-motivated, under-staffed, and very rarely reach far beyond the district headquarters. With the difficult terrain, visiting farmers is a challenge as up to 48 hours rigorous walk are often needed from the respective agriculture and livestock service centre. Where FtF trainers are located in the remote VDCs there is an immediate point of contact for farmers to receive advice and assistance.

Modus Operandi for the FtF Approach in Nepal

The FtF agriculture extension approach has been gradually introduced by SSMP over the last 10 years in 20 districts, and in more recent years, successful attempts have been concluded to introduce the approach at the VDC-level where it has effectively delivered agriculture extension services and inputs to over 80,000 farmers many of them residing in far-flung areas.

Services are provided by the ELFs who were lead farmers of groups and who received special training, both theoretical and practical,to enhance their technical knowledge, skills and social competencies; they then act as extension agents and provide agriculture services to other farmers and farmer groups in their own, adjacent or nearby VDCs.

The FtF approach should be part of a demand-driven farmer-led extension system. Project proposals are prepared by the farmer groups, initially with the assistance of a local service provider, and submitted for funding and approval to the agency providing the assistance, be it a project, programme, government agency, NGO or VDC.

In brief, therefore, the "lead farmer" delivers services based on the demand of farmers groups, and in response to a proposal submitted by a farmer group. On approval of the proposal, funds are provided to the farmer group for both inputs and for paying for the training and coaching services received from the "lead farmer", who is paid for her or his services directly by the demand farmer group. The "lead farmer" is identified by the funding agency, and then mobilized to coach and train the farmer groups. SSMP's ELFs are available in all 378 VDCs of the 7 programme districts to provide services in, among others, improved farmyard manure management, improving cattle sheds, preparation of bio-pesticides using cattle urine as a base, and the production of improved grain varieties, vegetables, polyhouse tomatoes, legumes and other cash crops. However, any agricultural message, or messages from other sectors, can be delivered to farmer groups, providing there are local extension agents such as the ELFs.

What Is Needed to Make the FtF Work at the VDC-level?

a) an institution to organize and facilitate the FtF system at both DDC and VDC level;

b) a trained team of local extension agents;

c) funding from a programme, project, or the block grants;

d) a funding system through which funds can reach the VDCs and, from there, the farmer groups and "lead farmers";

e) a system through which individual farmers and farmer groups can apply for assistance.

Benefits and Impacts of the Approach

SOCIAL AND ECONOMIC BENEFITS

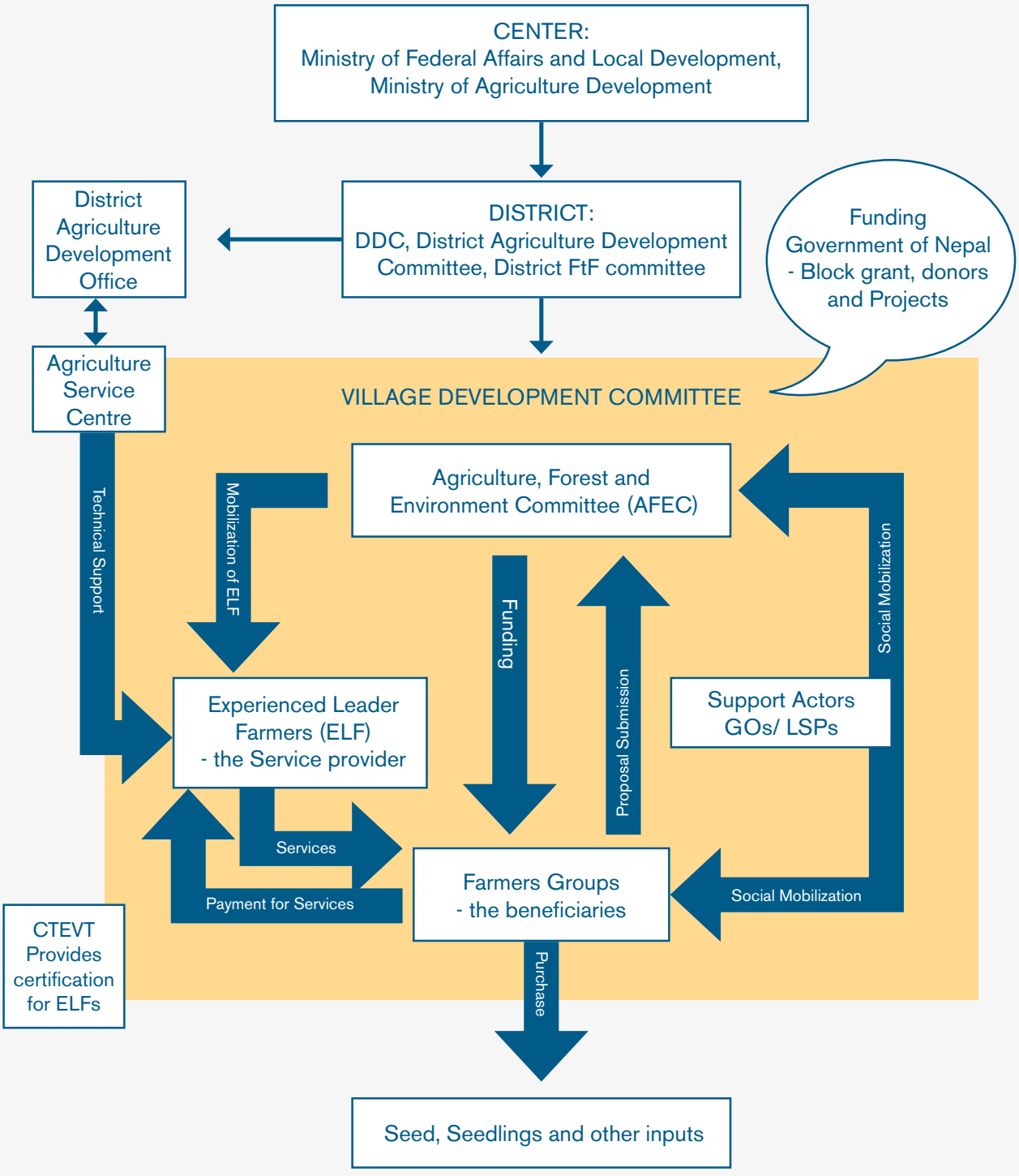
- the FtF approach provides opportunities for people from all walks of life, background and status to become a lead farmer and thus grow in terms of knowledge, skills, self-esteem and confidence;
- this is especially true in terms of women and the discriminated groups, who are especially empowered;
- the extension services provided through the FtF approach can be accessed by the poor and discriminated groups, as there is less likely to be bias as to beneficiary selection, and lead farmers are developed from all ethnic groups, castes and are both male and female;
- if decentralized to the VDCs, as has been the case with SSMP, services can be provided even in remote areas, far from the district headquarters – this also provides hope and encouragement for the farmers in remote corners of Nepal;
- lead farmers are paid for their services, thus this represents a first step in the establishment of a private extension service system, and also provides additional income to the lead farmers;
- the decentralized FtF approach provides a system of extension that all projects, programmes, NGOs, and INGOs can buy into – providing funds for supporting a local system and local lead farmers for delivering services to farmers;
- an operationalFtF extension system is much more economic and cost-effective than numerous and largely immobile civil servants based in the district headquarters or at the diminishing number of Agriculture Service Centres – the role of the GoN system will change as GoN agriculture staff take on a technical back-stopping role, training the teams of lead farmers in new, appropriate and required technologies, and acting as an advisory and capacity building service.

Lessons Learnt

THE FtF APPROACH

- is a cost effective service delivery mechanism;
- has led to increased participation of local people in the planning, budgeting, implementation and evaluation of agricultural development programmes;
- has empowered women and the disadvantaged through providing opportunities to become an ELF, a confident trainer and a respected member of the community;
- has led to significant and beneficial impacts on productivity and livelihoods in remote areas – previously untouched by the existing extension services.

Institutionalizing FtF Extension Approach at VDC level



Approach # 2: The Experienced Leader Farmer (ELF)

What and Who is an ELF

Experienced Leader Farmers are lead farmers of groups or are especially innovative, committed and industrious farmers and who have been identified as potential trainers by project, programme, and local NGO or government staff.

Not all farmers have the technical competence, skills, personality or desire to become an ELF. Only those farmers who are involved in farming, have experience of increasing profits and improving their own livelihoods through agriculture, should become ELFs.

Those lead farmers believed to have the natural attributes and desire to coach and demonstrate to other farmers are specially trained in technical knowledge, skills and social competencies – they then act as extension agents and provide agriculture services to other farmers and farmer groups in their own or nearby VDCs.

The Characteristics and Role of the ELF

Attributes of the best potential candidates would be: enthusiasm for agriculture and to assist others, sound agricultural skills and experiences, ability and interest to develop new skills, methods and technologies and to trial, test and experiment, natural leadership skills, patience and politeness.

The role of the ELF in the FtF extension approach is crucial - hence, special attention needs to be given to identifying and developing the ELF. Following identification of a farmer with potential to become a lead trainer, they are then provided with an initial week-long practical training.

Currently, ELFs are able to provide support and basic services to other farmers through providing practical group training, coaching and backstopping in:

- preparing a farm and production plan and an agricultural calendar,
- improved farm and soil management,
- improved farmyard manure preparation, management and storage,
- cattle shed improvement, collection and storage of cattle urine, and preparation of bio-pesticides,
- improved crop and water management with specialist knowledge of a few key potential commodities,
- generating demands and proposals from farmer groups to be submitted to the funding agency,
- maintaining their own farm as a model farm and learning centre for other farmers.

Development of the ELF

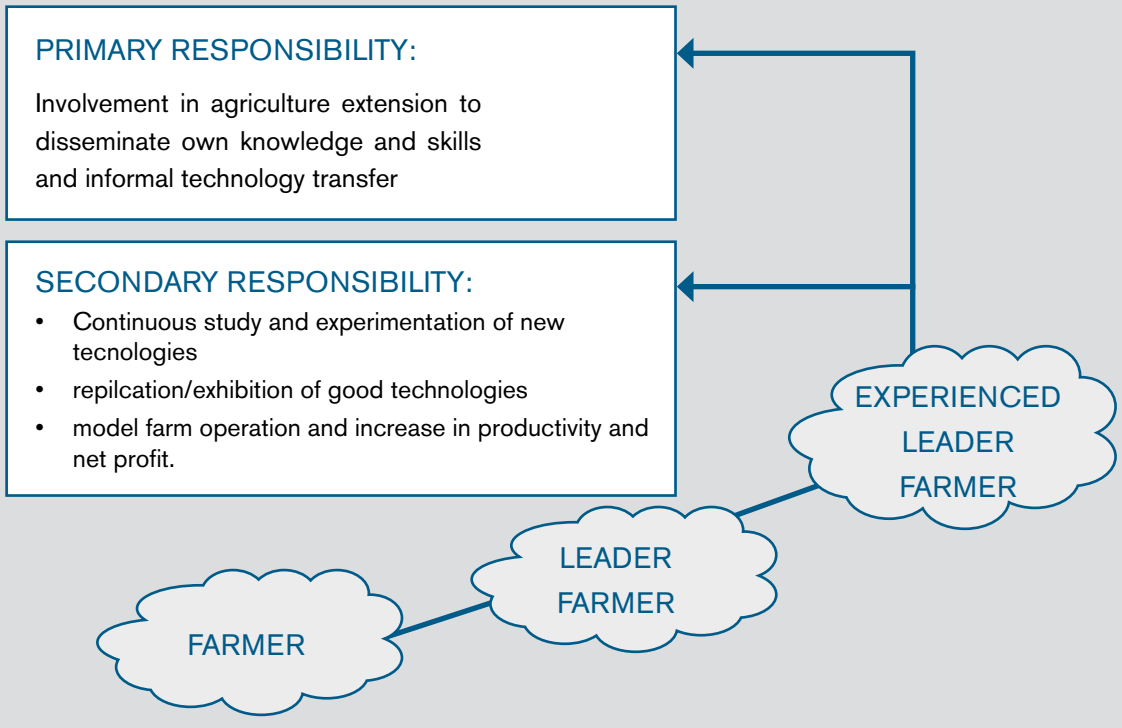
ELFs are developed in all VDCs in each of the working districts to deliver agriculture services, so that services are available to those even in the most remote districts.The targeted training and coaching includes the following:

- an initial one week basic training in farm, crop and soil management, both theory and practical,
- on-farm support for a year to ensure that the proposed ELF is creating a model farm and putting into practice all the technologies and practices learnt,
- after 6 months to a year, a second, refresher training which will include some more advanced training including the modalities of decentralized extension,
- after this second course, the ELF can be mobilized and, with some extra support and coaching, is ready for Level 1 NSTB certification. Ideally, the new ELF is sent on one or two missions with a more experienced ELF.

In each district, rosters of the available ELFs are available at the VDC, the DADO and DLSO offices and to other interested projects and programmes.

For those with the appropriate ambition, attributes and skills, the ELFs can go on to take Level 1 and Level 2 tests of the National Skills Training Board (NSTB). In the past 4 years, SSMP has funded over 200 ELFs through the Level 1 test.

The Main Responsibilities Of The ELF



Achievements and Impacts

DURING THE PERIOD 2011 - 2014, SSMP ACHIEVED THE FOLLOWING:

- 1,993 ELFs were developed in the 7 operational districts (42% are female, 13% Dalit, and 30% Janajati),
- 665 ELFs were mobilized thru' AFECs, by the VDCs, DADOs and by other projects to serve 2,039 farmer groups (40,651 farmers), in 294 VDCs in the 7 districts,
- through use of the block grants, services have been provided to an additional 2,204 farmer groups (39,804 farmers),
- over 200 ELFs have passed the NSTB (National Skills training Board) test and are now certified as Level 1 trainers.

THE MAIN IMPACTS SEEN ARE:

- enhanced self-esteem and self-confidence of the ELFs who have gained improved status and respect within the rural community;
- empowerment of women and the discriminated especially;
- a cost-effective and workable extension service operating at the VDC level, and serving farmers even in the most remote parts of the VDC.

Lessons Learnt

- the ELFs, working through the FtF system, reach to the remote often forgotten corners of isolated VDCs, which remain un-reached by other extension modalities;
- the ELFs need to derive from a mixed ethnic background in order to cater to the diverse groups applying for extension services;
- special efforts are required to ensure that sufficient numbers of ELFs derive from Janajati and Dalit communities to ensure a balanced team of extension workers in any one district – this is also partly true of women, but SSMP has had significant success in training female Lead Farmers to ELF status – 42% of all ELFs developed in the past 4 years are women;
- the ELFs need to be accomplished in both technical farming matters as well as strong and firm social skills - in order that they can ensure the participation of women and the discriminated in the training, the on-farm experimentation, the receipt of the various inputs, and the decision making processes;
- lead farmers are usually selected on the basis of their farming expertise and it is assumed that they are good communicators, disseminators, and innovators – but this is not always the case, and in fact to have all these skills naturally is a rare combination. An extension approach recruiting only farmer experts who may not be very good in dissemination may not be very effective - thus future emphasis should be placed on ensuring that the best and most active "technical" ELFs also have the skills and patience to be effective trainers and communicators;
- ensuring the quality of the ELFs in both technical and communication skills, requires regular support and coaching – this can derive from good links with the DADO and its Agricultural Service Centres, programme and project specialists and other local resource persons;
- in order to enhance the pass rate of the NSTB certification test, it has been found that some extra coaching and tuition is useful before the test takes place. The CTEVT can run the tests either in Kathmandu or send examiners to the districts, which was becoming increasingly common in the period 2013-2014;
- it has been noted that those with off-farm employment experience (eg. returning migrants) are often better disseminators and more effective innovators due to their greater world-experience – this may be a useful option for returning migrants who might feel receptive to establishing an agrovet outlet and combine this with advisory and extension services following relevant training;
- SSMP has learnt that farmer extension agents and even volunteer farmer trainers supported by outside agencies can effectively spread the use of new practices (eg. the rapid uptake of table nurseries in Okhaldhunga and roll-out to other districts) – this supports research from other parts of the world (eg. Kenya) which shows that farmer to farmer dissemination is very important in spreading innovation and sustainable practices;
- it is often those few very active leader farmers who are responsible for most of the dissemination – thus, the challenge is identifying those skilled communicators and enthusiastic disseminators, which is a challenging task; the reason why SSMP has developed nearly 2,000 ELFs in the past four years was that it was realized in the previous phase of the project that 50% would drop out, migrate, be unavailable or unable to travel, or would be poor disseminators;
- the ideal number of active farmer extension agents in each VDC would be between from 4 and 6, comprising mixed background and gender;
- it is therefore important thatno barriers limit farmers, whether poor, women or discriminated, from becoming extension agents, disseminators or innovators – an inclusive extension service is essential in Nepal, as the beneficiaries of the service delivery are very mixed - socially, economically, ethnically, and linguistically.

Shyam Maya Rai, an Experienced Leader Farmer from Baruneshwor VDC in Okhaldhunga, training members of another farmer group

Farmers being provided training in polyhouse tomato cultivation by a fellow farmer and observing the developing results later in the season

Approach # 3: Decentralized Agriculture Extension at the Local Level

Rational Behind the Approach

The existing public agriculture extension system of the Government of Nepal (GoN) remains in most regards centralized and top-down, meaning that full participation of farmers in programme planning, implementation, monitoring and evaluation, decision making and overall programme management has not occurred. The existing programmes are thus not owned by farmers, rural communities, or even district level stakeholders. Extension from the districts is weak with limited coverage, low effectiveness and low cost efficiency, and responds poorly to the problems, concerns and priorities of the poor farmers, women or the disadvantaged, especially those in rural areas far from the district headquarters. Such centralized top-down systems are often criticized for not pursuing extension programmes that foster equity. The main reasons behind this are:

1. Lack of local level institutions responsible for carrying out agriculture extension.
2. Insufficient numbers of trained extension agents to provide services to farming communities scattered across the remote areas of Nepal.
3. Lack of funding for agriculture, specially at local level.
4. Insufficient pro-poor focus in the implementation of agricultural policies.

Approach in Brief

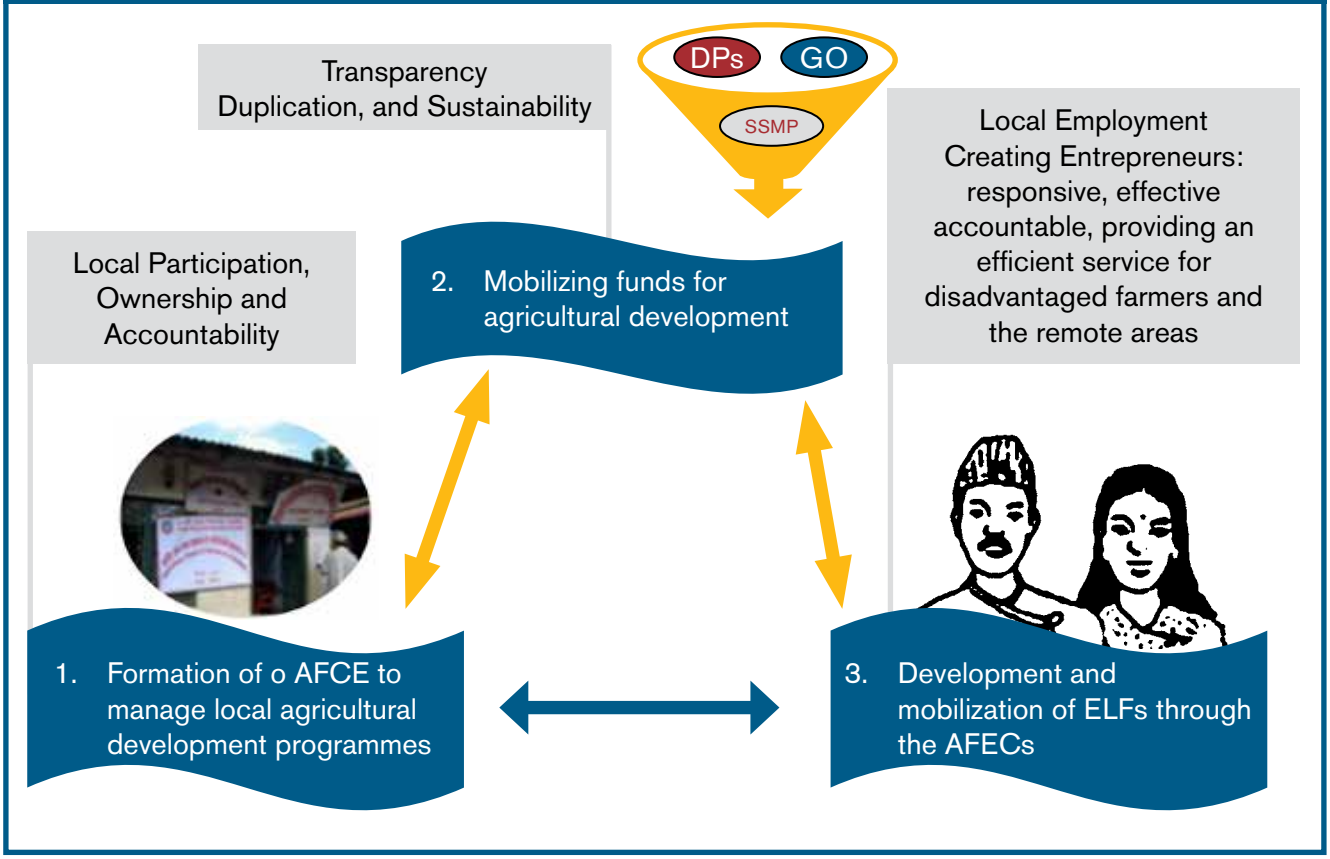
Decentralized agriculture extension is a system through which authority and responsibility for extension are transferred from the central to the local level. An implicit requirement for such a system to function effectively is that funds, functions and functionaries are established at the local level. For example, in the Nepalese context, funds for agriculture development need to be made available or generated locally at the VDC level – such funds might derive from central government grants, donor-supported projects and programmes, revenue from local government and other line agencies, or private enterprises (eg. promotional initiatives).

Current approaches in Nepal supporting agricultural extension reach at best those communities nearby the district headquarters. Having piloted the decentralization of agricultural service delivery to the VDCs in Phase 3 (2008 to 2010), SSMP's focus in the period 2011 to 2014 has been on the establishment of the Agriculture, Forestry and Environment Committees (AFEC) in all the VDCs of the programme's 7 working districts.

The AFECs are established at the VDC level in line with the Local Self Governance Act and the Local Self Governance Regulations of 1999, whichpermit the establishment of 5 committees at the VDC level, one of which is the AFEC.

It is envisaged that once established and the committee members trained, the AFEC,through the transparent and responsible use of the governments' block grants and funds from projects, will be responsible for the development of the agriculture sector in the VDC - from agricultural programme planning, project implementationthrough to monitoring and evaluation. Included as the backbone of this approach is the operational management of the FtF extension approach through the mobilization of the Experienced Leader Farmers (ELFs) and other local resource personswho will provide services to diverse farming communities, and technical assistance to the Committee itself.

The Decentralized FtF Extension Approach - a potential solution for effective service delivery



Modus Operandi

There are many farming communities in Nepal which rarely receive extension services. To improve this situation and to make the farmer-to-farmer system operate properly at the VDC level, the following basic elements need to be put in place.

1. Establishment and Capacity Building of the AFECs at the VDC (under the aegis of the LSGA 1999). The AFEC is responsible for mobilizing the ELFs in response to demands from the local farmer groups and communities within that VDC. The Committees, which ideally number between 7 and 12, consist of selected members who are local individuals, and representative of all main groups in the VDC. Training and coaching of the AFEC members is then essential in many different aspects – and this is a major medium term, and time consuming challenge.

2. Development of Experienced Leader Farmers or other local resource persons in each district to deliver agriculture services in all VDCs, both those in more accessible areas, and those more remotely located. In each VDC, it is necessary to have at least four and preferable six active local resource persons who have been trained to both provide basic agricultural services and to interact properly and effectively with the farmer groups. SSMP has developed ELFs in all the districts in which it has worked; in its current 7 districts, 1,993 ELFs have been developed in the past 4 years. In each district, rosters of the available ELFs are available to all, and copies maintained at the DADO, DLSO and AFEC offices.

3. Farmer Groups – many of the farming communities in Nepal are organized into groups, and in all cases they need informing of this new availability of service provision at the VDC level, the existence, roles and responsibilities of the AFEC, and their own responsibilities (eg. planning, project proposal preparation and submission). This awareness training and coaching can be provided by projects' social mobilizers, the Community Awareness Center, where it is active, or by suitable qualified ELFs, local service providers, local resource persons or AFEC members.

4. Supporting Actors – the main supporting actor in the district is the DADO, the staff of which, including the JTAs at the ASCs, must provide support in:

a) the establishment of the AFEC,

b) the initial coaching and capacity building of the committee members,

c) regularly supporting the AFECs in all matters,

d) the development, and regular training and back-stopping of the ELFs,

e) assisting the AFECs in maintaining the roster of the available and active ELFs and other local resource persons,

f) awareness raising and promoting the FtF programme at both district and VDC level,

g) coordinating with the DDC and district line agencies,

h) lobbying for fund allocation for the local agriculture sector,

i) monitoring, evaluation and progress documentation of the FtF extension programme.

Other support actors who play important roles in different aspects of this decentralized system of extension include staff from the DLSO, officers and staff from the DDC and VDC, the local NGOs, CBOs and resource persons, and other projects and programme – all of whom can facilitate in one beneficial way or another the process of AFEC establishment and FtF institutionalization at the VDC level - eg. in training, coaching and back-stopping of the ELFs and farmer groups, advocating for funding for local agricultural development, facilitating in awareness campaigns on decentralization and governance issues, undertaking public planning events and audits, assisting farmer groupsto plan and prepare proposals, and undertaking participatory planning, monitoring,and evaluation,as well as impact surveys.

The Role of the AFECs

Once training and coaching of the AFEC members has been completed – and this is a major and time consuming challenge - the specific responsibilities of the AFEC include:

- endorsing and/or amending the existing by-laws and fund operating guidelines for effective and efficient use of the agriculture development funds;

- establishing the agricultural priorities of the VDC and developing annual plans;
- submitting the by-laws, local agricultural plans and budgets, and progress reports to the VDC Council, and obtaining endorsement;
- tapping resources for funding the FtF approach and the overall agricultural development of the VDC – through the Block Grant system, and from donors and projects active locally;
- conducting awareness campaigns on the FtF approach and informing the public, for example through the Community Awareness Centres and Ward Citizen Fora, of the necessity to submit proposals;
- ensuring that the farmer groups are provided with a template for proposal preparation and are assisted in filling it in, by ELFs, other local resource persons or staff from the DADO or ASC – the completed form is then submitted to the AFEC;
- collecting, assessing, evaluating and approving the farmer group proposals, taking into account the availability of funds;
- disbursing the funds to the farmer groups whose proposals have been approved;
- identifying and mobilizing the ELF with the appropriate required skills and experience to coach and work with the farmer groups, and making a simple agreement with the ELF (or other local resource person) and the beneficiary farmer group;
- ensuring that the beneficiary farmer group is equipped to receive the assistance, and has a 3 or 4 member executive committee who will be responsible for monitoring of the funds (received from the AFEC), the activities performed and the preparation of a brief report on the activities undertaken for submission to the AFEC. The funds provided by the AFEC are used for both payment of the ELF and the purchase of necessary and approved agriculture inputs;
- confirming that the ELF is paid for her or his services by the farmer group;
- maintaining comprehensive records of all evaluation-approval processes, the disbursement and expenditure of funds, and an up-to-date roster of ELFs.

Achievements

- 378 AFECs have been established in all the VDCs within the 7 SSMP working districts;
- all 4,401 members of these 378 Committees have been trained and supported;
- in September 2011, the Ministry of Federal Affairs and Local Development (MoFALD) directed all 3,625 VDCs to allocate at least 15% of their VDC block grants for agriculture development – enough to annually support at least 12 farmer groups in each VDC through the FtF programme;
- the Ministry of Agriculture and Development (MoAD) then issued a directive in December 2012 to all 75 District Agriculture Development Offices directing them to ensure: a) their active involvement in the establishment of the AFECs; b) the appropriate utilization of the budgets allocated for agriculture development; and c) the mandatory incorporation of the FtF extension approach into their regular annual plan and programming;
- following the piloting stage at district level, all the District Development Councils of the 7 SSMP districts committed themselves to establish an AFEC in all the VDCs - greatly encouraging the local management of agricultural development and adaptation, and stimulating local support for farmers;
- in financial year 2013/2014, the mean sum allocated for local agricultural development by the 378 VDCs was 13% of the block grant, which provided services to 2,204 farmer groups (40,651 farmers); in addition, 216 AFECs mobilized 618 ELFs to provide coaching in the improved technologies, many of them climate smart, requested by the farmers;
- in 2013, the MoAD mainstreamed and up-scaled the AFEC-FtF extension approach in a cattle-shed improvement programme to an additional 33 VDCs, expanding to 59 districts in 2014;
- in 2014, the MoFALD with technical support from MOAD and SSMP prepared a local agriculture programme operation and management guideline; at the time of writing, awaiting endorsement by the Cabinet before distribution to all VDCs in the country.

Impacts

- the establishment of the AFECs, the commitment of the local authorities, and the support of the Ministries has empowered local communities to take decisions more systematically on local agriculture development programmes, and to plan, budget, implement and monitor them;
- in addition, as the bye laws of all the AFECs stress the need to serve all community members and the need for inclusion, it has empowered the poor, the discriminated, and especially women, who have become Committee members, lead farmers and extension agents;
- there is now a body at VDC level, the AFEC, that is run by farmers for farmers and can respond to farmers' needs including food security issues and climate change impacts;
- with the support of the Ministries and district authorities, and local enthusiasm from the rural communities, a new, cost-effective and locally available system of farmer support has been born – and with this, rising belief by local communities that they can provide for themselves

Lessons Learnt

- there is much local support for the establishment of AFECs at the local and District level – all DDCs and VDC Secretaries in the 7 SSMP working districts supported the policy of establishing an AFEC in all VDCs and providing services to farmers through the FtF approach;
- the AFEC has much local support from the rural community as it is more directly accessible and accountable to local farmers than the district headquarters, which can be 2 to 3 days walk away for farmers in more remote areas – only to find that those they need to see are absent, or inputs unavailable;
- one of the major challenges is the capacity building of the AFEC members, who necessarily derive from local, often remote areas, and require much medium term support in many different aspects; they first need basic training in conducting meetings, taking minutes, administrative and finance management, participatory planning, monitoring and evaluation, and agricultural fundamentals so that they can assess and evaluate proposals coming from the farmer groups;
- the benefits of this approach include:- empowerment of local communities to take responsibility of their own futures and livelihoods; service provision available locally through a committee of local people, all of whom are farmers; a system that can extend agricultural messages and new or improved technologies to all corners of a district; a new more manageable role for the DADOs and the DLSOs who become facilitators, trainers, advisers and who have a much larger number of change agents under their remit.

Members of the AFEC in Namadi VDC Ramechhap, May 2011

Orientation on AFEC and the FtF approach at Manma VDC in Kalikot, 2012

Approach # 4: Funding Decentralized Extension at the Local Level

Approach in Brief

The Government of Nepal has been allocating funds to local bodies through support from the Local Governance and Community Development Project (LGCDP); the LGCDPreceives support from many international and bilateral donors active in Nepal for local development activities. In the past, much of the funding support has been spent on infrastructure programmes, and very little on agriculture. However, in 2011, the MoFALD issued directives to all the VDCs to allocate at least 15% of the total block grant to the agriculture sector; this provision is now considered as an indicator in the Minimum Conditions and Performance Measure (MCPM) of the local bodies.

This approach intends to provide at least a minimum of funds for local agricultural development, and toprevent the over-expenditure and occasional wastage of funds on unnecessary infrastructure programmes. It was also envisionedthat the 15% would provide the seed money of a basket of all funds allocated at the VDC level for the agriculture sector, and encourage other private and public donors (eg. international donors, INGOs, and line agencies) to deposit funds at the VDC for local agriculture development.

Against an approved programme proposal, the funds are then provided by the AFEC to the farmer groups for services (payment of the lead farmer) and purchase of inputs.

Modus Operandi

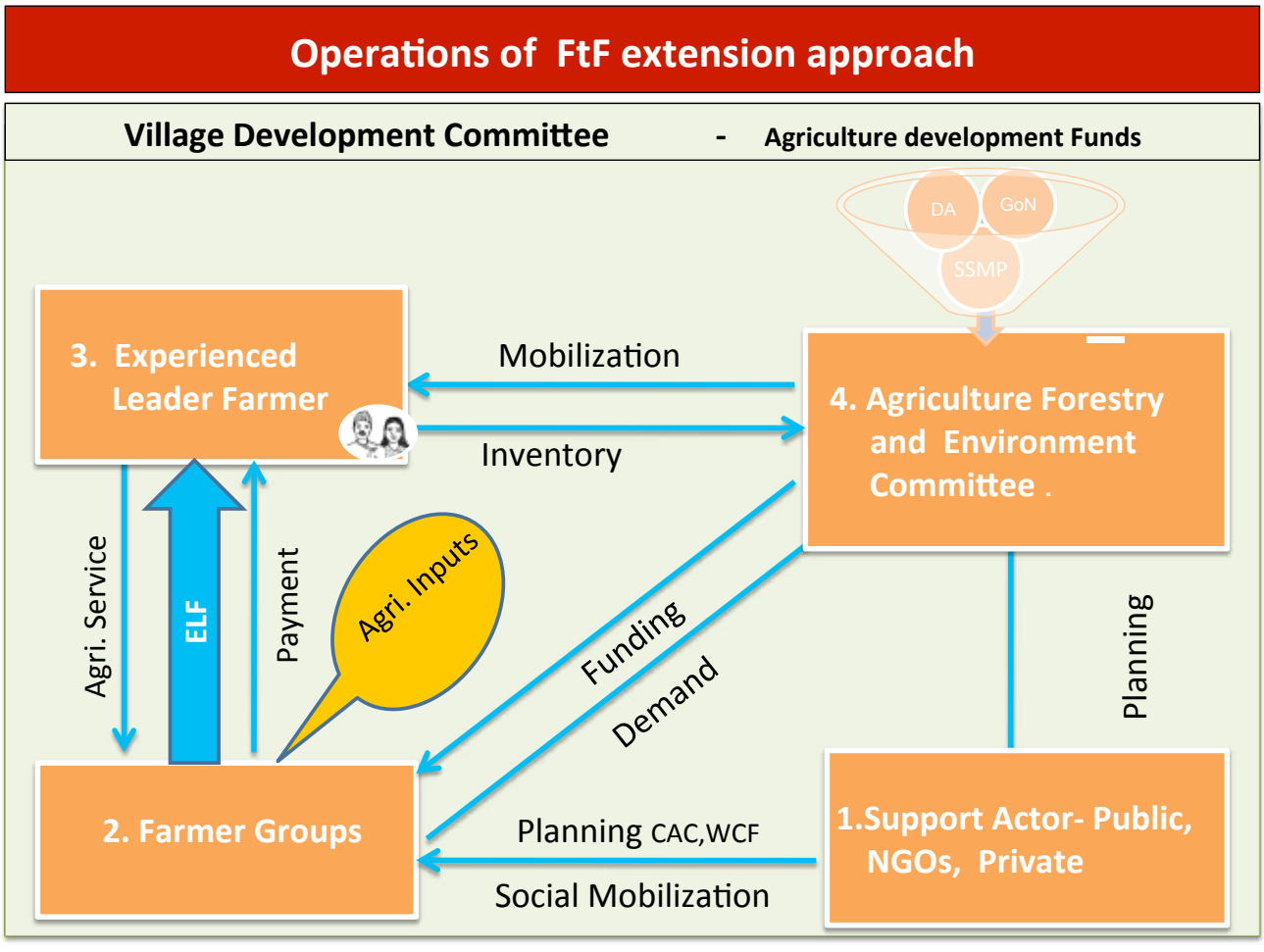
1. Establishment of an agriculture development fund at the VDC under the Village Development Fund (VDF).
2. Channeling of the funds from the centre (the block grants) through the District Development Fund.
3. Basketing of funds from other development partners, the I/NGOs, and the line agencies.
4. The VDC-AFEC will then call for proposals from farmer groups who want assistance, training, and/or inputs or an agriculture service of one form or another; this can be done through the Community Awareness Centres, Ward Citizen Fora, through local FM radio and other means of public announcement.
5. On approval of the farmer group proposals, the funds are disbursed to the farmers groups by the VDC-AFECon the basis of the sanctioned budget.
6. Technical support is then provided to the groups by a local resource person or ELF.
7. On completion of the coaching and/or input provision, the farmer group will then pay the local resource person for the service, and prepare a short report for the AFEC.
8. The process, outcomes, and impacts of the provided service and inputs will be supervised and monitored by members of the AFEC.

Benefits of the Approach

- The MoLD has now specified that at least 15% of the total VDC budget will be allocated for local agricultural development – ideally therefore, there are now funds available for farmers in all 3,625 VDCs.
- In compliance with the GoN policy on donor funded projects, funds now pass through the GoN pathway - through the district development fund and on to the VDF at the VDC.
- This process increases transparency, the efficiency of fund management, and the effectiveness of the funds, which are utilized at the local level, are monitored and disbursed by the local committee, for the farmers in their community.
- Regular monitoring by the AFEC, who are on the spot in the VDC, optimizes the use of the funds by the farmers groups.
- The system permits services to reach to the people even in remote VDCs, and increasesthe access of farmers in all parts of the country to assistance and new agricultural technologies.

Lessons Learnt

- Delays sometimes occur at the district level, where staff absences, bureaucratic delays, and frequent staffchanges inhibit the free flow of funds.
- Leadership skills vary in all walks of life – where the AFEC has active and committed leadership, the system can evolve efficiently and effectively so that farmers are provided funds on time in relation to the agricultural calendar.
- Where there may be political interference, transparency may become opaque. However, as the AFECS consist of between 7 and 11 members from the local community, the great majority of them farmers themselves, the risk of corruption is considered to be small.
- Where there is poor leadership and organizational skills, the monitoring and recording of this step by step process may not bevery good, especially in the first year or two of AFEC formation.



Approach # 5: The One-Window Approach at the Local Level

Approach in Brief

The government, the NGOs, the private sector and civil society organizations currently execute their agriculture programmes independently without any proper cross-project or VDC-level coordination. This has resulted in several cases of duplication and waste, and even misuse of resources. Due to this lack of an effective mechanism for institutional coordination, the VDC does not have any information on the agriculture programmes which are operating in their territory.

The establishment of AFECs in all VDCs would mean that there is now a mechanism and authoritative body in place for the VDC to take the central role in planning the agricultural development of the VDC. Initially, the VDC and the AFEC will need much coaching, assistance and more experience in this, but it is envisioned that in the future, the VDC-AFEC will prepare annual and periodic plans, and lead and coordinate all government and non-government development programmesthat are undertaking agriculture activities in the VDC. As a result of this evolution, all funds will be deposited in a basket designated for use in the approved agricultural activities.

In this way, and with all donors and implementing agencies, whether government or private, informing the VDC Council meetings of their programmes and budgets, the VDC and AFEC members will be fully informed of the activities being conducted in their area. The entire programme will then be approved and reflected in the VDC plan - which encourages ownership of the programme by the locally responsible bodies, and commitment for the integrated local development of the agricultural sector.

Another responsibility of the AFEC is to lobby for funds for particular programmes such as micro-irrigation schemes, cattleshed improvement, or a focus on a particular commodity.

This form of one-window approach will thus permit the VDC-AFEC to be in a good position to both lead local-level agricultural development, and respond to the needs of the farmers, according to approved proposals and the available budgets. The AFECs will also be responsible for developing local resource persons who they will mobilize to support the farmer groups.

Proposed Modus Operandi

The first essential in the one window approach is the development of a Village Development Agricultural Plan for each VDC, prepared and led by the AFEC and local community with the assistance of knowledgeable professionals from the DDC (eg. Planning Officer), the DADO and DLSO, local NGOs, projects and programmes working in the VDC and willing donors prepared to fund and assist the process.

The VDC development plan will be formulated based on the socio-economic, and physical and technical potential of the VDC, and if funds and technical expertise is available, can include all sectors, although in terms of the AFEC, the focus is on agricultural and livestock production.

All the line agencies and NGO and donor programmes, as well as needs of the local farmers, will be reflected in the plan, as will be the considered and feasible aspirations of the AFEC and local community; as in the HELVETAS Village Development Periodic Plans, the proposed development plans will have cover a period of 5 years, and incorporate a prioritized list of goals, objectives and planned activities. A budget will be drawn up on the basis of these prioritized activities, spread out realistically over the 5 years.

The budget will be based on the expected block grant funds, current funds available through government, private and donor projects, and future projected funds required to meet the objectives of the plan.

All government and project funds for the agriculture sector will be managed and allocated by the AFEC following agreement with both the line agencies and the projects and programmes funded by the private sector and the donors.

The VDC and AFEC will be responsible for raising its own revenue through campaigning and awareness raisingof potential fund providers. Developing skills in such promotional activities will require some training.

Benefits of the Approach

- The VDC and AFEC will have a blueprint on which to work, will be accountable to the local community for the implementation of the plan, and will have all the funds available for agricultural programmes at its disposal.
- A basket of funds will be available for larger projects such as irrigation schemes.
- The AFEC will be responsible for and have the funds available for the mobilization of the local resource persons on the basis of the plan – this will result in effective extension, efficient and responsive service provision, and will create local employment.
- As the AFEC will be fully accountable and answerable to the local community, the opportunity for misuse of funds and other resources will be reduced; as all funds will come through the same basket at the VDC, the chances of wasteful duplication of funding and activities will also be minimized.
- Through regular meetings, the AFEC and participants active in the development of the agriculture sector will review progress, monitor and evaluate on-going programmes, and ensure that funds are being efficiently disbursed, properly used and having the intended impact.
- As the members of the VDC and its committees are accountable to the farmers, and management of the development programme is the VDC responsibility, farmers will no longer have to travel to the District headquarters to request services and assistance. One important responsibility of the AFEC is to facilitate the establishment of an Agrovet outlet in each VDC to ensure that necessary inputs are locally available at the right time of the agricultural calendar.
- Through this approach, all members of the community and associated actors will come together and foster complementarities, and farmers will experience an increase in the ownership of the overall VDC's development, which will enhance optimism and responsibility, and feed into renewed energy, effort, hope and enthusiasm. As a result of the AFECs being established on the principles of social inclusion, the rural poor and disadvantaged will have enhanced access to agriculture services and opportunities.

Lessons Learnt to Date

- Where inclusive AFECs have been established, and the one-window approach promoted, the feeling of ownership and accountability to the programme is significantly increased.
- The approach is strongly supported by the local community, the VDC Secretaries, as well as the political parties, all of whom benefit from both a committee responsible for agriculture, and the basketing of funds, the knowledge of what is being implemented in the VDC, and the regular progress meetings.
- As all development funds are managed by the VDC, the risk of duplication is minimized, programmes can be linked to enhance impact, the risk of fund wastage and misappropriation is reduced and as a result the coverage of extension services is increased.
- Overall, there is an increase in trust and confidence of the local community in the operational modality of the VDC and its committees, and the fund allocation for the agriculture sector.

Approach # 6: Participatory Planning at the Local Level

Approach in Brief

In regard to the agriculture sector, this approach employs the following processes: bottom-up planning, community budgeting, participatory monitoring and evaluation, and public audits. It has resulted in enhanced local ownership, and has improved the procedures for claiming social rights and government resource allocations at the local level.

This approach is effective in initiating systematic agricultural production, in making best use of local resources,and enhances the capacity of the service receiver;in addition, it is successful in responding to the expectations of local farmers through effective service delivery, based on demand proposals from the farmers.

The approach also contributes to the strengthening of local institutions, both government and private,by linking an integrated community planning process to national policy and procedures concerned with participatory planning - documented in the Local Self-Governance Act (1999), the Good Governance Act (2006), the Right to Information Act (2007),in various guidelines such as the Grand Mobilization Guidelines (2008, 2009, 2010), the Local Bodies Resource Mobilization and Management Guideline (2012), and in related programmes– the Local Governance Programme (LGP), the Decentralized Local Governance Support Programme (DLGSP), and the Local Governance and Community Development Programme (LGCDP) – all of which focus on citizen centric governance and effective service delivery at the local level. In addition, the approach supports the process of periodic planning at the district, municipality and national levels.

Proposed Modus Operandi

Participatory planning in agriculture at the local level involves all stakeholders – the individual farming households, farmer groups, local community groups and organisations (eg. the Citizen Ward Fora and the Community Awareness Centres), and the VDCs. Based on individual household plans and group consensus, farmer groups prepare their plans and requests for support, which are endorsed, rejected or enhanced by the AFECs. The approved plans are then included in the annual VDC agricultural plan of activities through a locally agreed planning process. In relation to agricultural planning, the AFEC is central for coordination, consolidating the plan, identifying and tapping of resources, and selection and approval of the farmer group demand proposals, as well as fund allocation and monitoring of the activities (see figure below). Currently more than 2,000 farmer groups in the VDCs of SSMP's 7 project working districts (Achham, Kalikot, Dailekh, Jajarkot, Ramechhap, Okhaldhunga and Khotang) have adopted this approach for driving forward local agriculture development.

Benefits of the Approach

THE APPROACH

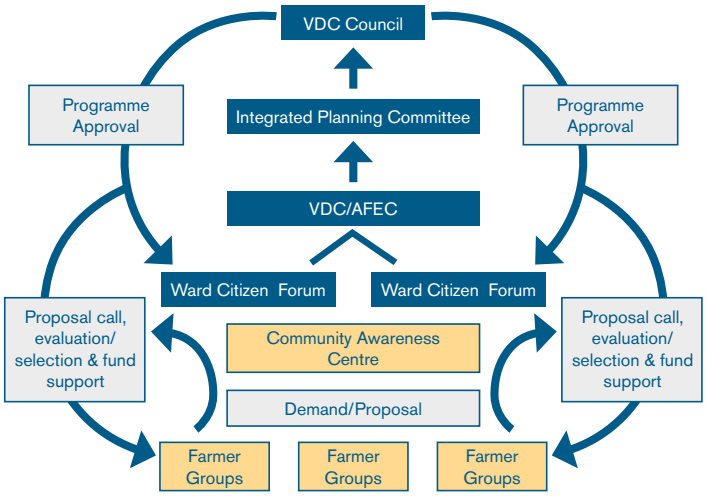
- ensures effective utilization of local resources and local capacities and ensures effective participation of the farmers,
- encourages systematic planning,
- results in ownership of the plan by the great majority of local residents,
- provides a basis for the one window implementation of various programmes and projects at the local level,
- promotes effective service delivery to respond directly and efficiently to the needs of local farmers,
- contributes to the institutionalization of an organized local level planning process, and improves local governance and transparency,
- enhances the skills and capacities of the VDC personnel, the AFEC members, the farmers, the farmer groups, the CSOs, and the involved local service providers.

Lessons Learnt

- even within the current political vacuum and confusion at the local level where no elections have taken place for 14 years, the adoption of this approach has raised awareness and shown thata decentralized process of planning which is in line with the national policy, is feasible;
- by fostering active citizenship and providing effective tools for planning – bottom-up planning, community budgeting, participatory monitoring and evaluation - it has contributed to much improved ownership,

responsibility, visibility and optimism, and has empowered local farmers to claim social rights such as resource allocation;

- both the VDCs and the agricultural line agencies at the district level need to harmonize their planning procedures and systems so that local level planning process is effective and easily included into the district level plans – this requires effective communication between the DDC and the VDCs, so that all planning is carried out in the same modus operandi;
- the vacuum at the local bodies, political uncertainty and the depleted capacity of the VDCs in terms of human and financial resources, as well as poor communication and inadequate information systems are still constraints to the institutionalization of this approach;
- in addition to the DDC and line agency staff, social mobilizers, local NGOs, other local service providers, CBOs, and ELFs, have important roles in this process in terms of social mobilization and providing support in the planning process;
- the use of the local media - FM radio, local newspapers, and SMS services – is very important, and has been seen to be very effective in providing information, key dates, processes and procedures, and providing answerers to questions (Q&As and FAQs).



THE PLANNING AND DEMAND RESPONSE MECHANISM AT THE LOCAL LEVEL - FOLLOWED BY THE AFEC AT THE VDC

Farmers and the extension workers together engaged in planning for agriculture activities at Tadi village of Kalikot district, 2012

Approach # 7: Linking Research and Extension at the Local Level

Approach in Brief

Effective linkages between research and extension are especially important in the agriculture sector to ensure the adoption of improved technologies in farming, improving farm management, productivity and food sufficiency. The approach followed by SSMP focuses on improving these linkages between research and extension by following participatory methods which bring farmers, researchers and extension workers, local service providers together at the farmers' fields.

Using a combination of methods – such as on-farm action research, farmer-led experiments (FLEs), demonstrations and farmer field schools - farmers take an active part in the research, and sometimes lead the investigations, often enhancing the study through the use of their unique practical farming experience and local knowledge and skills, and verify the research outputs with the research partners. Promising results and findings can be immediately tested by other members of the farmer group, and where proven successful – for example, in terms of productivity, market demand or labour saving - can be demonstrated in larger plots for wider adoption by other farmers and farmer groups visiting the site.

Proposed Modus Operandi

Farmers initially identify their problems and needs, and, with or without the assistance of a technical supervisor, implement simple on-farm research plots, known as farmer–led experiments, and evaluate the different technologies or measures employed with assistance from research and extension workers. Some of the more complex specific problems are taken to a nearby research or agricultural station, where, in consultation with farmers and local extension workers, research trials are designed and then undertaken on both farmers' fields and the research station. Joint visits and interactions are organized throughout the duration of the trial.

Implementation of research activities on farmers' fields, especially on those lead farmers such as the ELF's, is very effective for further extension of research findings, particularly in remote areas.

Benefits of the Approach

- the extension of the research findings is easier and adoption is faster, especially in rural areas,
- farmer field experiments are effective in building the confidence of farmers, and often replicated by a number of farmers on several fields, thus providing greater evidence of the effectiveness of different practices, procedures and treatments,
- given willing efforts from all parties involved, functional linkages between extension and research are enhanced, and result in more effective and widespread adoption and sustainability,
- the improved ownership of the process by the farmers results in a faster rate of adoption of the best practices – as exemplified by the rapid spread of the table nursery in the eastern districts,
- as farmers are involved, solutions are generated at local level and are necessarily cheap and cost-effective – thus, any tendency to "Rolls Royce" a solution to any particular problem is nipped in the bud, and thus solutions are farmer farmer-friendly and appropriate for the majority of farmers in Nepal.

Lessons Learnt

- the approach provides an opportunity to farmers to utilize their knowledge, skills and experience in finding solutions to their problems – this enhances imagination and innovation, as well as improves interaction between farmers, and between farmers and the research scientists;
- several innovative technologies have been generated by farmers over the years of SSMP implementation – these include the table nursery, cost-effective rainwater collection systems, ponds for water storage, construction of polytunnels using local materials, protection of farmyard manure heaps and pits using local waste materials, utilization of human and animal urine in drip irrigation systems, and experimentation of many different locally available plants for production of bio-pesticides;
- establishing such on-farm research and experimentation plots on farmers' fields has resulted in greater confidence of the farmers, higher adoption rates, increased trust in new technologies and advice deriving from the research scientists, and a much improved understanding of the situation and real needs of the farmers by the researchers.

A farmer led experiment on pest control in Juchhini through pheromone trap, Ramechhap, 2013

On-farm field trials on organic management of red ant, Dhading, 2008

Published by Sustainable Soil Management Programme (SSMP)
HELVETAS Swiss Intercooperation Nepal

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