2018

Opportunity Mapping in Livelihoods in Arunachal Pradesh

Arunachal State Rural Livelihoods Mission

Itanagar

Contents

Introduction

Arunachal Pradesh translates to “the land of the first rays of the sun” in India. Arunachal Pradesh, earlier known as Northeast Frontier Agency, and largest of the seven sisters of North East India, shares international boundaries with Bhutan, Tibet, China and Myanmar and state boundaries with Assam and Nagaland. Arunachal Pradesh attained its statehood on 20th February 1987. With a land mass of 83743 sq. kms area Arunachal is the largest state in the north-east region area wise.

Geography of Arunachal Pradesh

The state is situated between latitudes 26.42° N - 29.30°N and longitudes 90.36°E - 97.30°E and shares international boundaries with Bhutan, Tibet, China and Myanmar and state boundaries with Assam and Nagaland. A part of the Eastern Himalayas, Arunachal Pradesh stretches over 83,000 sq km. Almost 60% of the state area is covered by green forests.

Much of the Land of Dawn-lit Mountains is covered by the Eastern Himalayas, except the southeastern corners of Arunachal Pradesh which fall in the Patkai Hills. Biogeographically, the state is the richest province of the entire Himalayas. The geography of the state is a complex hill system with an altitudinal variation ranging from 50m in the foothills that gradually ascends to peaks which are as high as 7000m, cut through by numerous rivers and rivulets. The state gets as much as five hundred centimeters of rain fall and this accounts for the large number of rivers and lakes in the region apart from extensive forests.

Besides the forests, there are rivers, streams, mountains, and peaks, giving the state abundant variations in scenic beauty. The major river of the state is Brahmaputra which enters from China and is called Siang in Arunachal Pradesh before it enters Assam and changes its name to Brahmaputra to finally flow into Bangladesh. Other important rivers of the state are Kameng, Subansiri, Lohit Kamla, Siyum, Dibang, Noa–Dihing and Kamlang.

This variation in climate and topography has favored the growth of massive forests where a delicate, graceful and symbiotic relationship exists between the tribes, the forest and the wildlife. The state has five different forest types and a sixth type of secondary forests – tropical forests, sub tropical forests, pine forests, temperate forests and alpine forests. These forests harbor extremely important biodiversity with the presence of over 5000 plant species, 86 land mammals, 500 birds and an equally diverse insect and reptilian life. Such unparalleled diversity of life can be credited to the unique location of the region, falling at the intersection of three different bio-geographic hotspots; the Paleoartic, Eastern Himalaya, and Indo-Burma regions.

Amongst the fauna, in the foothills and adjoining plains large herbivores such as elephant, gaur and wild buffalo inhabit the jungles. The state is perhaps the only place in the planet where 7 wild cats are found together; tiger, leopard, clouded leopard, snow leopard, golden cat, leopard cat and the marbled cat. The jungle canopy of Arunachal Pradesh are home to seven primate species such as hoollock gibbon, slow loris, Assamese macaque, rhesus macaque, pig-tailed macaque, stump-tailed macaque, and capped langur. All the three goat antelopes of India are found in the state; the serow, goral and the mysterious takin. The jungles also have a lively and chattering population of smaller mammals with species of squirrel, porcupine, civets, mongoose, linsang, shrew and bat. In the higher altitudes, exotic species such as goral, Himalayan black bear and red panda are found.

People of Arunachal Pradesh

The state is home to more than 26 major tribes and over 100 different sub-tribes, with diverse traditions and customs. This has allowed for an amazing linguistic diversity with 90 different languages spoken in the state. Arunachal Pradesh has attracted cultural anthropologists and explorers since long who have come from faraway countries to study the treasure trove of traditional knowledge. Geographically, the cultural diversity of Arunachal Pradesh can be roughly divided into cultural spheres, on the basis of tribal identity, religion and language. Then there are transition areas where clusters of less dominant tribes reside. The western cultural sphere is rooted to Tibetan Buddhism and early Bon animist traditions with the presence of tribes such as Monpa, Aka, Brokpa and Sherdukpens. The Aka are traders and paint their faces

with fascinating black marks. Brokpa are semi-nomadic herders who roam the highlands during the summer. The Monpa weave excellent carpets and take pleasure in wood painting.

In the center and eastern parts of the state, the cultural sphere finds influence from animist traditions and lineage to faraway lands till Mongolia. The major tribes that live here are the Nyishi, Hill Miri, Apatani, Galo, Adi and Mishmi. Nyishi are a powerful tribe, excellent craftsmen of cane and bamboo. The Hill Miri men wear a unique hairstyle, while the women wear cane blouses, fashionable and made from nature. The facial tattoos and nose plugs of the Apatani women have been well documented and remain fascinating. The Apatani are excellent in land management, rearing both fish and rice in their farms and building houses close to each other. The Adi have colourful dancing rituals with clothing that have exquisite patterns and designs. Their intricate cane bridges over large Himalayan rivers testify their ingenious skills. The Mishmi are excellent bamboo craftsmen and hunters. They remain an incredible repository of traditional knowledge which has been passed through shamans, folklore, dances and religious rituals.

The southeastern cultural sphere traces lineage to Southeast Asia, where tribes such as Khampti, Singpo and Tangsa have been influenced by Theravada Buddhism. Sharing this sphere are the Nocte, Lisu and Wancho with animist influence. Wancho have beautiful dresses and ornaments. Along with the Nocte, they were excellent headhunters in early times. The Khamti and Singpho are rich traders. Their rulers had mutual relations with the British Empire in pre-independence time, along with connections that stretch though entire Southeast Asia.

Amicable and friendly, the tribals of the state are extremely democratic; each tribe has their own structured institutions that revere the elders, maintaining law and order, settling disputes and caring for the welfare of the villages.

It is in this context that the Arunachal Pradesh Rural Livelihoods Mission (ArSRLM) is attempting to find the right balance in promotion of livelihoods which is cognizant of the huge diversity inherent to the state geographically and demographically.

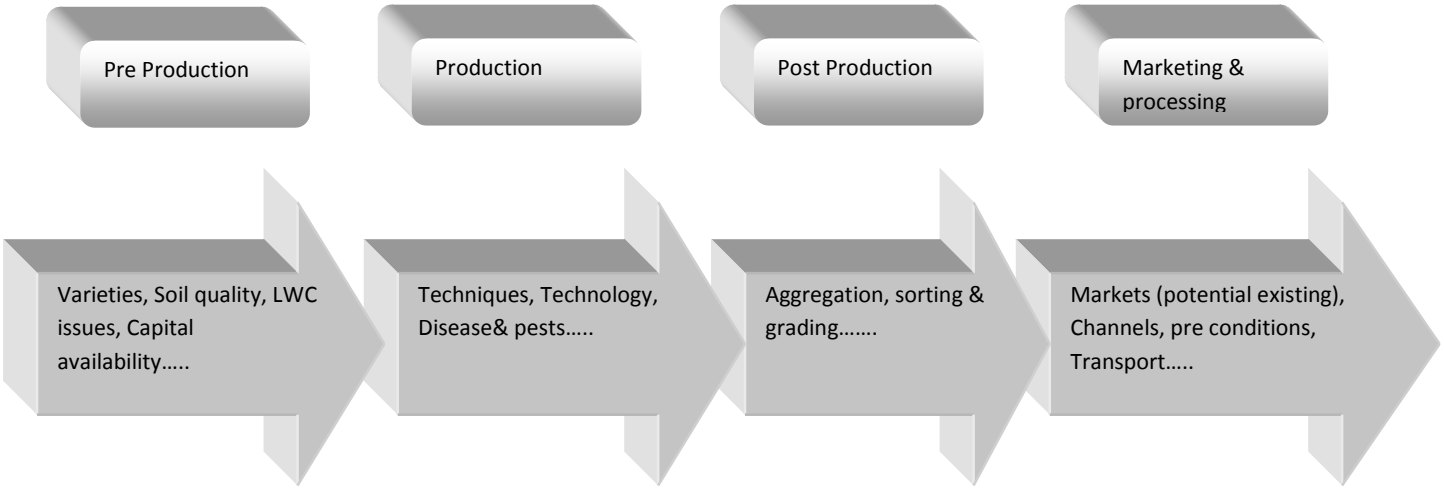
About ArSRLM

Arunachal State Rural Livelihoods Mission (ArSRLM) is an autonomous Society registered under the Society Registration Act of 1860 under the aegis of the Government of Arunachal Pradesh. It is the Nodal Agency for implementing the NRLM / Aajeevika schemes in the state. The Mission embodies the principles and vision of NRLM while keeping in mind the unique features of the State. Structurally, ArSRLM comprises of staff at the State, and Block level to cater to the requirements of rural areas across the State. ArSRLM (Arunachal State Rural Livelihoods Mission) aims to reach out to the Poorest of the Poor (PoP) households across 21 districts , 112 blocks, 4211 villages and stay engaged with them till they cross the Rubicon (threshold) of poverty. At present 7 Blocks in 7 District of the state- Papumpare, Lower Subansiri, Upper Subansiri, East Siang (now Siang), West Siang, Lower Dibang Valley and Namsai districts have been taken up and will be covered as Intensive Resource Blocks.

Thus far ArSRM with its dedicated team of young professionals working in remote areas of the state has been able to mobilize women from more than 8000 HHs into more than 900 SHGs further federated into 18 Village level Organizations across 125 villages in the 7 Resource Blocks. Even as we speak the missions efforts are on to further federate them into VOs. The SHGs have been able to mobilize savings of upto 51 Lakhs *(as on February 2018).*

Executive Summary:

The opportunity mapping process undertaken by the Mission involved National Resource Person (NRPs) from NMMU, interaction with farmers, orange cultivators, important stakeholders in the Vision of the Mission such as line deptts, traders and SHG members in four Blocks namely Namsai, Pangin, Roing and Yachuli (Ziro I). Multiple rounds of FGDs were organized with all stakeholders combined with secondary data analysis as well as analysis of the primary data collected during the interactions. The study looked at primarily four sectors (given in the illustration below) of the value chain for every commodity to understand the opportunity(ies) both inherent/latent as well as potential.



The understanding which the study was able to discern that there is substantial value to be captured in all the four sectors for the participating families who are related to agriculture. The unique geographical positioning of Arunachal has created some conditions which meant that all the four sectors vis Pre production, Production post production and Marketing are operating sub optimally. The major aspects of the study are as follows

1. Paddy is the major crop grown to fulfil household needs. Paddy needs **High Priority** to be accorded to the pre production as well as the production phase. Pre production has the potential of enhancing values for the farmer by upto 5%. Production segment on the other hand also needs to be accorded **High Priority** as it can push up the value for the cultivator by further 20%.

   Especially significant for smallholders such as the Assamese families we encountered in Deobil of Namsai and also the “Adivasis” families who have managed to procure some lands for themselves as encountered again in Namsai.

2. Spices such as Ginger and cardamom hold special place in terms of value to be captured for the cultivator. A detailed value chain study has been attempted for large cardamom but it can safely be said that both these spices need **High priority** to be accorded to both the production pre production and Post production[1] measures which have the potential to enhance value for the cultivators by almost **25%**.

3. High Value commodities like Orange needs to be accorded **High Priority** especially in Pangin. There are critical gaps in both the Production and post production aspects for orange cultivation which needs to be accorded High Priority. Addressed adequately the measures have the potential of gathering almost 20% additional value for the cultivator. Corollarily, the pre-production activities like Nursery establishment can be accorded **Medium Priority** which can further add to the value which can be captured for the rearer.

4. Vegetables and its potential have found a resonance in almost all the blocks the study was conducted in and for almost all categories of SHG members whether large landholders medium landholders or smallholders and marginal *(like the "Adivasis")*. Pre production elements can push up the value capture for cultivators by almost 20% and therefore may be accorded a **High Priority** action point for the Mission in the coming days. This is more important because these are natural "organic" clusters with niche value to be captured with appropriate measures like certification etc. Production related elements like PoP, Organic inputs (for pest and disease mgmt),nursery mgmt etc which are lacking can be easily done and holds a good value proposition for the cultivator (almost 35%). A further 15 to 20% additional value can be grabbed by aggregating the produce at the VO level and using it as a point of negotiation with traders. This along with appropriate pre-production interventions can be an **High priority** action point for the Mission team. As of now the major markets like Tinsukhia (for Roing and Namsai) are inundated by vegetables from Northern Assam like Barpeta which can be easily upstaged because of the low transportation costs from Roing and Namsai.

5. Blocks like Roing which already have substantial oilseeds producing families need to take up the pre-production segment (land & water conservation, critical irrigation investments, farm mechanisation) as a **Medium Priority** item as it would need more time and capital investment and also convergence tie ups. Post production aspects such as aggregation of the produce can be taken up on a **High Priority** basis as it has a ready potential to capture an additional value to the tune of 25% for the cultivator. Trainings on Production techniques can also be taken up as a Medium priority area as there is substantial losses owing to diseases and pests which can help the cultivator save an additional value of 5 to 10%.
6. Livestock rearing such as pigs (all the blocks covered

[1] A detailed analysis and report of Priority actions for every block has been provided on page 2

under the study) and fisheries (in Yachuli) can be accorded **High priority** as demo fish and pig farms would have to be developed as also infrastructure work like ponds maintenance can be taken up under convergence. But the mission can initiate livestock interventions by arranging for animal health care and extension around appropriate feeding which can then be consolidated into a larger livestock program over a period of 2 to 3 years from its beginning

7. Water Harvesting structures (WHS) and Land & Water Conservation (LWC) measures are needed almost in all the blocks for the benefit of the extant population. The accruing benefits would be there for all kinds of livelihoods activities and across all segments of the population. Areas such as Namsai and Roing have a lot of potential for such structures to be taken up with convergence efforts which can help cultivators produce more and thereby galvanise sub-optimally operating sectors such as vegetables etc. Considering the need for convergence for these interventions we suggest these as **High Priority** area but one which will take time for fruition but will have long term impacts for the region.

Detailed Priority Analysis for opportunities in the covered Blocks

Namsai

Pre Production	Priority	Production	Priority	Post Production	Priority	Marketing	Priority
Paddy							
Varietal Change (as prescribed by the Agriculture deptt and with focused pilots preceding large scale adoption).	MP	Lowering Seed rate	HP	Pulses & oilseeds after paddy crop	MP	NA	NA
LWC	MP	Seed selection and treatment Mechanical weeders Organic inputs for DPM[2] Introduction of SRI					
Vegetables							
Critical irrigation infra. LWC by convergence Capital Support	HP	Intensification & commercial approach to Vegetable cultivation Trg on nursery mgmt Organic Inputs	HP	Aggregation at village level	HP	NA	NA
Livestock rearing (pigs & goatery)							
Convergence dialogue with Line Deptts Awareness trgs.	HP	Animal Health Camps Regular de-worming and Mineral supplements providence through convergence Demo breeding units to be set up in	HP	NA	NA	NA	NA

[2] Disease & Pest Mgmt

		villages Demo units for scientific rearing					
Organic inputs Production							
Identification of entrepreneurs	HP	Trg and Technical support	HP	Supply networking with other blocks	HP	NA	NA
Fruit orchards & horticulture promotion							
Exposure visits of farmers to neighbouring best practices	MP	Setting up of demo units of orchards in contiguous patch	MP	NA	NA	NA	NA

Pangin

Pre Production	Priority	Production	Priority	Post Production	Priority	Marketing& processing	Priority
Paddy							
Varietal Change (as prescribed by the Agriculture deptt and with focused pilots preceding large scale adoption).		Introduction of lower Seed rate					
Capital Support	MP	Seed selection and treatment	HP	Pulses & oilseeds after paddy crop	MP	NA	NA
LWC		Mechanical weeders					
Farm mechanisation		Organic inputs for DPM[3]					
		Introduction of SRI in plain areas with assured irrigation (For eg Namsai)					

[3] Disease & Pest Mgmt

Ginger							
Varietal change to Nadiya Variety		Commercial intensification by cultivators		Aggregation at village level		Promotion of local Processing entrepreneurs	MP
Capita support	HP			Aggregation infrastructure creation through Convergence	MP		
Rhizome preservation							
Vegetables							
Capital support	HP	Intensification & commercial approach to Vegetable cultivation	HP	Aggregation at village level	HP	As of now not envisaged as the volumes are too less in the contiguous markets.	NA
Critical irrigation infra.		Trg on nursery mgmt		Sorting and grading at Village level			
LWC by convergence		Organic Inputs for DPM					
Fruit orchards & horticulture promotion							
Exposure visits of farmers to neighbouring best practices	MP	Setting up of demo units of orchards in contiguous patch	MP	Aggregation at village level	HP	Mktg assistance to farmers	HP
Large Cardamom							
Capital Support	HP	Trg on orchard mgmt, plantation tech. etc, Soil PH awareness etc	HP	Aggregation at village level	HP	Mktg assistance to farmers	HP
LWC Measures (bunding etc)	MP	Intercropping with pulses	MP				
Promotion of “shade” trees		Terracing	MP				
Orange							
Nursery establishment trg and demo	MP	Orchard mgmt trg		Harvesting techniques trg	HP	Mkt info	HP
		Disease and pest mgmt	HP	Sorting grading tech trg to farmers for segregation of premium products		Aggregation of produce	

		Nutrient top up for better produce					
		Algae control					
Livestock rearing (pigs)							
Convergence dialogue with Line Deptts		Animal Health Camps				Mkt info	
Awareness trgs.	HP	Regular de-worming and Mineral supplements providence through convergence	HP			Aggregation of produce	MP
						Mkt assistance	

Yachuli (Ziro I)

Pre Production	Priority	Production	Priority	Post Production	Priority	Marketing& processing	Priority
Paddy							
Varietal Change (as prescribed by the Agriculture deptt and with focused pilots preceding large scale adoption).		Introduction of lower Seed rate					
Capital Support	MP	Seed selection and treatment	HP	Pulses & oilseeds after paddy crop	MP	NA	NA
LWC		Mechanical weeders					
Farm mechanisation		Green Manuring					
		Organic inputs for DPM[4]					

[4] Disease & Pest Mgmt

		Introduction of SRI in plain areas with assured irrigation				
Ginger						
Varietal change to Nadiya Variety	HP	Commercial intensification by cultivators		Aggregation at village level	Promotion of local Processing entrepreneurs	MP
Capita support				Aggregation infrastructure creation through Convergence	MP	
Rhizome preservation						
Vegetables						
Capital support	HP	Intensification & commercial approach to Vegetable cultivation		Aggregation at village level	As of now not envisaged as the volumes are too less in the contiguous markets.	
Critical irrigation infra.		Trg on nursery mgmt	HP	Sorting and grading at Village level	HP	Increment of production is critical to take it to local markets where it will be very competitive	MP
LWC by convergence	MP	Organic Inputs for DPM					
Short duration varieties introduction	HP						
Fishery						
Convergence	MP	Development of model fish farms	MP			
Livestock Rearing (Pig)						
Convergence dialogue with Line Deptts	HP	Animal Health Camps	HP		Mkt info	HP
Awareness trgs.		Regular de-worming and			Aggregation of produce	HP

		Mineral supplements providence through convergence					
						Mkt assistance	MP
Large Cardamom							
Capital Support	HP	Trg on orchard mgmt, plantation tech. etc, Soil PH awareness etc	HP	Aggregation at village level	HP	Mktg assistance to farmers	HP
LWC Measures (bunding etc)	MP	Intercropping with pulses	MP				
Promotion of "shade" trees		Terracing					

Roing

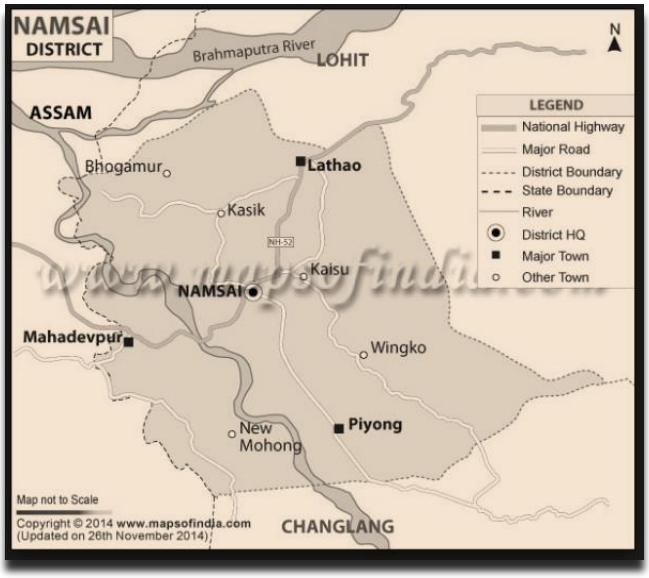
Pre Production	Priority	Production	Priority	Post Production	Priority	Marketing& processing	Priority
Paddy							
Varietal Change (as prescribed by the Agriculture deptt and with focused pilots preceding large scale adoption).		Introduction of lower Seed rate					
Capital Support	MP	Seed selection and treatment	HP	Pulses & oilseeds after paddy crop	MP	NA	NA
LWC		Mechanical weeders					
Farm mechanisation		Green Manuring					
		Organic inputs for DPM[5]					

[5] Disease & Pest Mgmt

		Introduction of SRI in plain areas with assured irrigation					
Ginger							
Varietal change to Nadiya Variety	HP	Commercial intensification by cultivators		Aggregation at village level	MP	Promotion of local Processing entrepreneurs	MP
Capita support				Aggregation infrastructure creation through Convergence	HP	NA	NA
Rhizome preservation							
Vegetables							
Capital support	HP	Intensification & commercial approach to Vegetable cultivation	HP	Aggregation at village level	HP	As of now not envisaged as the volumes are too less in the contiguous markets.	NA
Critical irrigation infra.	MP	Trg on nursery mgmt	HP	Sorting and grading at Village level	HP	Increment of production is critical to take it to local markets where it will be very competitive	MP
LWC by convergence	MP	Organic Inputs for DPM	HP				
Short duration varieties introduction	HP						
Livestock Rearing (Pig)							
Convergence dialogue with Line Deptts	MP	Animal Health Camps	HP	Promotion of breeding units	MP	Mkt info	HP
Awareness trgs.	MP	Regular de-worming and Mineral supplements providence through convergence	HP			Aggregation of produce	HP

Scoping Study Report: Namsai Block

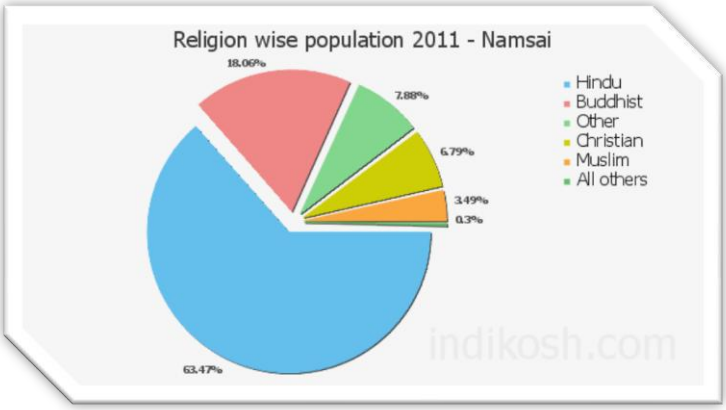
Namsai became the 18th district of the state of Arunachal Pradesh in 2014 carved out of the Lohit distirct. It is inhabited by the tribes of Tai Khamti, Idu, Aadi, and Assamese social groups such as Gogois, Sonowals. Lohars etc. It also has a sizeable population of Adivasis from Jharkhand who were brought by the British to work in the adjoining tea estates of Assam and also in Arunachal Pradesh. As part of the study we visited 4 villages the names of which have been provided in the table given below.



Overview of Namsai Circle	
Basics	
Country	India
State	Arunachal Pradesh
District	Lohit
No of villages	30
Demographics	
Population	26865
Growth of Population	-6%
Sex Ratio	908
Sex Ratio Child	976
Literacy Rate	72%

The district is home to about 27 thousand people, among them about 14 thousand (52%) are male and about 13 thousand (48%) are female. 65% of the whole population are from general caste and 35% are schedule tribes. Child (aged under 6 years) population of Namsai is 17%, among them 51% are boys and 49% are girls. There are 5505 households in the district and an average 5 persons live in every family. Socially the major groups are the following

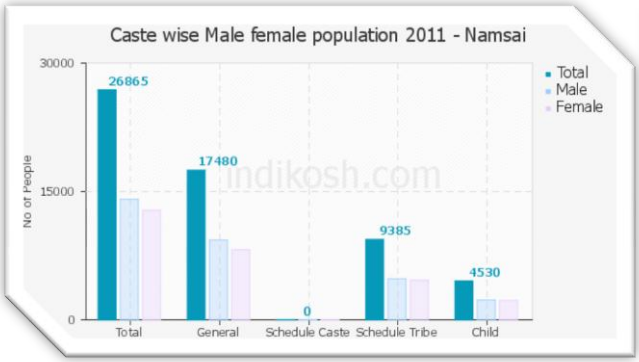
(a) Arunachali tribes (Khamti, Idu, Aadi)
(b) Assamese ethnic groups (Sonowals, Lohars, Gogois) and
(c) The “Adivasis” (locally known as the Mundas).

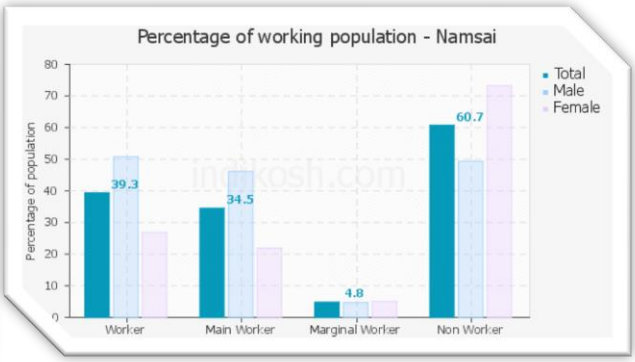


Secondary Data about the Block

Workers profile

Namsai has 39% (about 11 thousand) population engaged in either main or marginal works. 51% male and 27% female population are working population. 46% of total male population is main (full time) workers and 5% are marginal (part time) workers. For women 22% of total female population are main and 5% are marginal workers.





Soil Types

The plains soils consist of the following types.

1) **Older Alluvium Type** It represents the formation of higher-level terraces in the foothill areas, consisting mainly of coarse sand and organic matter. The soil is generally loamy and brownish in colour.

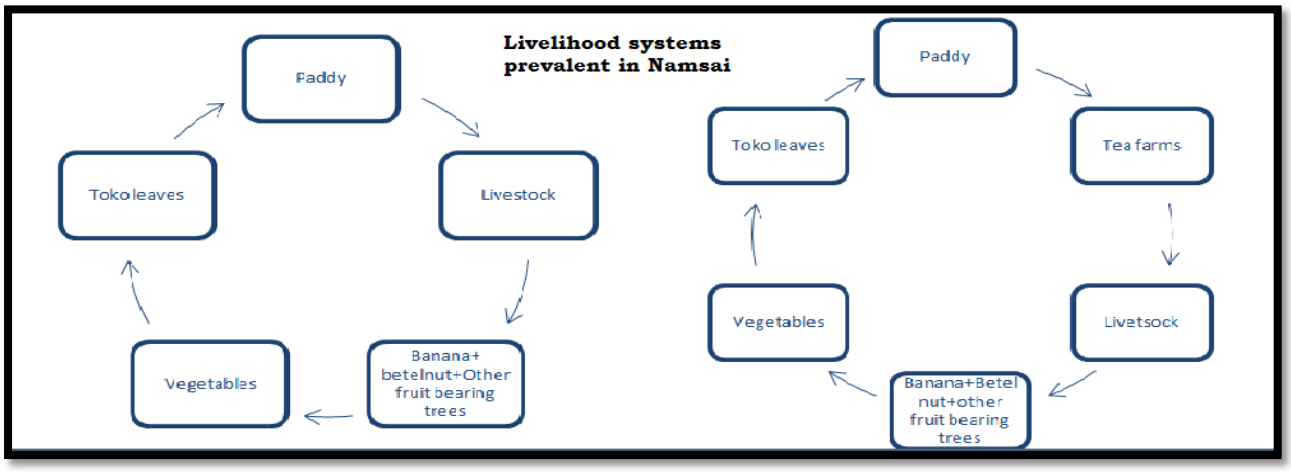
2) **Silt Type** This type consists or comparatively recent alluvial deposits characterized by shallow surface layer of silt with a sub-soil of coarse sand sometimes mixed with pebbles and boulders. The soil is sandy and comparatively poorer.

3) **Low Level** Type It includes depressions and swamps, which remain submerged under water for sometimes during the rainy season. The surface soil is generally clay.

Rainfall and Climate:

The climate of the district is largely influenced by the nature of its terrain. Climate is sub-tropical (rather cool), wet and highly humid in the lower elevations and in the

valleys. The area falls in heavy rainfall belt and average annual rainfall is 5179 mm.



Our major observations were as follows majorly there **two livelihood systems** that are at work in the district. With resources being similar to neighbouring districts in the state of Assam the livelihood practices are also similar. It is a majorly paddy growing belt with a host of other horticultural activities bringing up the remaining livelihood practices. Each family has diversified its livelihood options with a host of vegetables and horticultural activities and dependence on livestock too. The major point, which struck us, was the no of animals available with each family. This is the most striking aspect from other districts of the state. This coupled with the fact that there is hardly any application of inorganic fertilizers and other inputs makes it a prime spot to promote sustainable agriculture.

For most of the Assamese and Munda families the first livelihood system is the preferred one as it is dictated by the ownership of resources especially land. On a larger note though this is a district that is characterized by its plain lands yet paddy cultivation is majorly deficit in terms of productivity. Each village which we visited barring the last one which was a fringe village (Nangthaw Khamti) most villages were grappling with food security especially for the 2nd and third social categories (the Assamese and Adivasis). Livelihood interventions need to be designed keeping this population in mind also as the point of intervention will differ from the first category. SO whereas the first category may just higher order value chain integration or collectivization the remaining categories may need more rudimentary support in enhancing productivity and in some cases introduction to newer livelihood practices. For e.g. vegetable cultivation for the Adivasis.

Sampling of villages

On discussion with the team we realised that the sampling of the villages have been done so that it gives a representative sample of the kind of villages where the team currently operates and also gives us an idea of the kind of opportunities which lie in the district of Namsai. We also tried to cover a few of the prevalent livelihood practices in the area like vegetables and tea plantations which seems to have caught the imagination of the population especially the landed Arunachal tribes. The local BMMU also ensured that the sample contains healthy representations of the communities that are residing in the project area for eg Arunachali tribes (Khamti, Idu, etc.), Assamese tribes (Gogoi, Sonowal etc.) and Adivasis from Jharkhand.

Cluster	Village	Sampling criteria- Unique features	Remarks
	Deobill I	Representative population; geographical location (nearer to Block and on the highway)	
	Bogamur Village	Majorly Assamese tribes; dependent on farming; remote area.	
	Nangpo	Mixture of Arunachali and Adivasis; remote area; Tea economy and sizeable Tea tribe presence	
	Nongthao Khamti	Fringe area economy	

Primary Data

Village: Deobill I

Livelihood portfolio analysis – profiling:

As per our discussions with families in Deobil they seem to follow the first system of prevalent livelihood activity mix. A paddy-based economy with families surviving on a host of other activities based on their resources like *Livestock-Combination of Banana+Betelnut cultivation-minor vegetables- Toko leaves-non farm activities like Mekhala weaving/petty business.* The majority of the land available is medium upland and some very small patches of low land. The paddy, which is grown, has very less productivity with 7 to 12 Q per acre, which can easily be enhanced to push the food sufficiency of people in the village

Community perspective on challenges and scope:

Community believes that there is scope only in animal rearing and getting jobs for the new generation as they feel with less irrigation available to families and rains being erratic it would be difficult to enhance agriculture productivity.

People preferences and choices

Prioritization of Activities

Type of LH	Product/Activity	Number and % HH engaged	Remunerativeness (high, med, low)	Risk (high, low, medium)	People preferences/choice (ranking)	Scope	Limitations/challenges
Farm Based	Paddy	100	H	M	Low	Definite scope for increasing productivity as food sufficiency is a major challenge in the area. As of now it is hovering at 7 to 12 Q per acre	Seed availability; information asymmetry about improved paddy cultivation practices. Land availability is also a challenge as it is only medium upland with limited productivity.
	Minor vegetables (gourd family;	90	M	H	Low	Scope for increasing productivity is definitely there. Right now it is only for domestic cultivation; Huge scope for sustainable agriculture as per capita bovine population is very high; high SHG penetration and willing families	Low knowledge penetration about newer practices and irrigation availability
Off Farm Based	Livestock (pig and BYP)	80 to 90%	H	M	High	There is scope for enhancing numbers of animals per family especially pig rearing; veterinary services can decrease mortality; people ready to pay for services	Lots of pilferage discouraging people to rear animals especially goats, duck, pigs and BYP. There are previous experiences of

						foreign bred varieties not surviving in the local environs; community not very open to such varieties of small ruminants and also pigs.
Non farm	Mekhala weaving	100%	H	M	Medium	

Major problem shared by the members	• **Paddy productivity is a major challenge faced by community as everyone grows it paddy for self sufficiency and then sale** • **There is a lot of pilferage related losses in livestock.** • **Only about 30% food sufficient despite paddy being a major product for most.** • **Vegetables mostly grown for own consumption; only 2 % of the families sell vegetables.** • **Landlessness is also there with more than 35% being landless.** • **Mostly the crossed varieties of pigs do not survive.** • **There is a huge scope for sustainable vegetable cultivation but is limited by the availability of irrigation.**
Members perspective on improving the livelihoods	• Vegetables (there are individuals who are selling vegetables but are very less in numbers) • Livestock especially pig and BYP are favoured by the community to enhance incomes. • Jobs for the next generation are another area which they feel can help them lead better lives

POP analysis of selected crops

Crop	Paddy
Area	
Pre Sowing /transplantation	
1. Field preparation	Done using power tiller and also in some villages by bullock, 3 ploughing is done and then leveling is performed.
2. Seed sourcing	
3. Seed rate:	35-40 Kgs per Ha
4. Seed Treatment	Seed treatment is not done
5. Seed Varieties and duration	
Sowing/transplantation	
1. Technique	Seeds are mostly sown in nursery and than 30-40 days old seedlings are transplanted in case of low lands whereas in uplands seeds are broadcasted and the seed rate is as high as 50-60 kg per hectare
2. Basal dosage (fertilizer):	No fertilizer is used in paddy
3. Top dressing (fertilizer):	
Plant management	
1. Weeding	Manual weeding is done, twice for transplanted rice and no weeding is performed in case of broadcasted paddy
2. Earthening up	
3. Irrigation/Moisture conservation	Field bunds are practiced in all paddy fields
4. Major Pest attack in last five years and its management	Rice Gandhi bug is prevalent however not much of control measures are used for controlling Gandhi bug
Diseases and its management Application of nutrient	No disease and pest management practices are followed in case of paddy
Harvesting &Post harvesting	
1. Harvesting method	Manual harvesting is done using sickle
2.Drying/Storage/ Grading /Packaging	
Yield	3.0- 3.5 MT per Hectare in case of transplanted paddy and 1.5 MT to 2.5 MT per Hectare in case of broadcasted paddy

Productivity and Cost benefits analysis of selected crops

Crop	Production cycle

Unit area		**Bigha**	
Sl. No	**Particular**	**Rate/ detail**	**Amount (Rs)**
	Set up cost		
1	Purchase of land	Per Bigha it costs around 5000-10000/- but no land ownership transfer done legally	10000
	Variable cost		
1	Seed	10 Kg seed for one Bigha, per kg cost is Rs 30	300
2	Ploughing	5 times with bullock, Rs 200 per unit	1000
3	Irrigation	1 to 2 times depending on rainfall	600
		Total cost	**11900**
Production		8 mon per bigha, 320 Kg	
		Gross Income (320Kgs Rs 12 per Kg)	**3840**
		Net income = (Gross- Variable cost)	**1940**

Village level price trend analysis of selected crops

Crop	**Price**											
	Jan	Feb	Mar	Apr	May	June	July	Aug	Sep	Oct	Nov	Dec
Paddy	10	10	11	12	12	13	13	14	13	13	12	10
Vegetables	L	L	L	H	H	H	H	H	H	Med	Med	Med
Ginger	8	8	8	8	15	15	15	15	15	12	12	12

Cropping system and seasonality analysis

Crop	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**July**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**
Paddy					LP	N	N	W	W	H	H	
Ginger	H		LP	P	E							H
Vegetables	H	H							LP	N	T	
Creeper Vegetable					LP	P		H				
Maize				LP	P	W		H	H			

Banana		H	H			LP	P			W	

*C= Cleaning, LP= Land preparation, P= Planting E= Earthening up S= Sowing, N= Nursery, T= Transplantation, E= Earthening up, W= Weeding, H= Harvesting, HP= Peak Harvest

Village: Bhogamur

Livelihood portfolio analysis – profiling:

As far as livelihoods goes we found that this is a village which is more agriculture dependent than others. This could be attributed to the fact that this is a village of Gogois'. Gogois' are an Assamese social group which are primary agriculturists and have brought the same culture in this part of the state too along-with them. As per our discussions with families in Bhogamur they seem to follow the second system of livelihood activity mix. A paddy based economy combined with tea farms with families adding to their basket a host of other activities based on their resources like *Livestock-Combination of Banana+Betelnut cultivation-minor vegetables- Toko leaves-non farm activities like shops/petty business.* There are no landless in this village and almost 30% of the families have more than 1 acre of land holding. Majority of the cultivators grow paddy with their own indigenous seeds. Ranjit variety, which is cultivated by only 40% of the family, whereas majority of the population prefers Lahi/Bor/Bora paddy for cultivation. The average productivity is higher than that of Deobil with around 18Q per acre being reported by the women who had gathered for the meeting.

Community perspective on challenges and scope:

The community feels that irrigation is a major problem which is spotting them from diversifying their livelihood portfolio (land based) and therefore is interested in investing in livestock. They are ready to pay for veterinary services too as there is zero veterinary support for their animals. Again like Deobil this village has a huge domesticated bovine presence, which is a good indicator for promoting sustainable agriculture through diversified utilities.

People preferences and choices

Prioritization of Activities

Type of LH	Product/Activity	Number and % HH engaged	Remunerativeness (high, med, low)	Risk (high, low, medium)	People preferences/choice (ranking)	Scope	Limitations/challenges

Farm Based	Paddy	100	H	M	H	Production can be increased as it is 18Q/Acre; Soil quality is good	
	Pulses (MatiKalai)	80	H	L	H		
	Betelnut	100	H	L	H		
	Horticulture	80	H	M	L	With assistance in irrigation and newer technologies more people can be encouraged to take up vegetable cultivation.	Lack of irrigation prevents from expansion and adoption by newer families.
Off Farm Based	Livestock	>80 (Cow, BYP and Goat)	H	H	H	Doorstep Veterinary services are essential.	Susceptive to infections; limited veterinary services.
		60 (pig)	M	H	H		
Non farm	Labour	>90	H				

Major problem shared by the members	**Lack of water sources in the village for irrigation** **Limited vet services in the village, which leads to high mortality in animals.**
Members perspective on improving the livelihoods	Horticulture activities and livestock rearing have the highest chance of giving them remunerative livelihoods.

POP analysis of selected crops

Crop	**Areca-nut**
Area	0.5 bigha (average)

Pre Sowing /transplantation	
1. Field preparation	Upland with slope or good drainage is selected for planting of areca-nut. The main plot is first ploughed 2-3 times to loosen the soil.
2. Seed sourcing	Areca-nut mostly plants are raised by the farmers, it takes 12-24 months for areca-nut saplings to get ready for planting
3. Seed rate:	200-250 saplings are required for 0.5 Bigha area
4. Seed Treatment	No seed treatment is practiced
5. Seed Varieties and duration	Local saplings are used, it takes 5-6 years for bearing areca-nut fruits
Sowing/transplantation	
1. Technique	Pit method is practised for planting areca-nut. Pits are made 6-7 feet apart with pit sizes 1 cubic feet. 12-24 month old seedlings are planted in each pit. No fertilizer is added.
2. Basal dosage (fertilizer):	No fertilizer is applied
3. Top dressing (fertilizer):	
Plant management	
1. Weeding	Weeding is done 2 times a year, one before monsoon during April/May and one after monsoon in the month of September/ October
2. Earthening	Earthening up is done during weeding before monsoon to avoid water logging at the base of the plant
3. Irrigation/Moisture conservation	No irrigation is done in areca nut plantation
4. Major Pest attack in last five years and its management	No such major pest incidence observed, but plant drying and dying is one major problems which occurs in mature plants
Diseases and its management Application of nutrient	No diseases is observed in last few years
Harvesting &Post harvesting	
1. Harvesting method	Manually harvested
2.Drying/Storage/ Grading /Packaging	Only graded on the basis of size, bigger size nuts fetch better price in market
Yield	20 MT/Ha

Productivity and Cost benefits analysis of selected crops

Areca-nut

Crop		Production cycle	
Unit area		**1/2 Bigha**	
Sl. No	**Particular**	**Rate/ detail**	**Amount (Rs)**
	Set up cost		
1	Purchase of land	Per bigha it costs around 5000-10000/- but no land ownership transfer done legally	10000
	Variable cost		
2	Planting material	200 saplings, Rs 20 per sapling	4000
3	Ploughing	3 times with bullock, Rs 200 per unit	600
	Pit digging and planting	5 labour days	1500
	Fencing	Lumpsum	3000
	Inter-culture operation	10 labour days	3000
		Total cost	**22100**
Production		10 kg per plant, 150 bearing plants	
		Gross Income (1500Kgs Rs 15 per Kg)	**22500**
		Net income = (Gross- Variable cost)	**10400**

Ginger

Crop	**Ginger**
Area	1 Bigha
Pre Sowing /transplantation	
1. Field preparation	Upland with slope or good drainage is selected for planting of areca-nut. The main plot is first ploughed 2-3 times to loosen the soil.
2. Seed sourcing	Stored locally from the previous year production
3. Seed rate:	300 Kg of rhizomes are required per bigha
4. Seed Treatment	No seed treatment is practiced
5. Seed Varieties and duration	
Sowing/transplantation	
1. Technique	It is planted in line method, where rhizomes are placed 6 inch apart and lines are made at 1 feet distance, rhizomes are placed at 3-4 inches depth then covered with soil
2. Basal dosage (fertilizer):	No fertilizer is applied

3. Top dressing (fertilizer):	
Plant management	
1. Weeding	Weeding is not a regular practice, however during sprouting if weeds are dense then one weeding is performed.
2. Earthening	Earthening up is practiced when it is done while taking out the mother rhizomes from the newly emerged plant
3. Irrigation/Moisture conservation	No irrigation is done in areca nut plantation
4. Major Pest attack in last five years and its management	No such major pest incidence observed
Diseases and its management Application of nutrient	Yellowing and rotting of rhizome is a common problem, which sometimes become very devastating, can cause 80-90% of crop loss
Harvesting &Post harvesting	
1. Harvesting method	Manually harvested
2.Drying/Storage/ Grading /Packaging	Not graded at farmer level, aggregators also don't practice grading of ginger, the wholesaler does grading.
Yield	10-15 MT/ Ha

Ginger cultivation

Crop		Production cycle	
Unit area		**Bigha**	
Sl. No	**Particular**	**Rate/ detail**	**Amount (Rs)**
	Set up cost		
1	Purchase of land	Per bigha it costs around 5000-10000/- but no land ownership transfer done legally	10000
	Variable cost		
1	Planting material	300 Kg per Bigha	4500
2	Ploughing	3 times with bullock, Rs 200 per unit	600
	Planting of rhizomes	2 labour days	600
	Intercultural operation	5 labour days	1500
		Total cost	**17200**

Production	1500 Kg per Bigha	
	Gross Income (1500Kgs Rs 10 per Kg)	**15000**
	Net income = (Gross- Variable cost)	**7800**

Cropping system and seasonality analysis

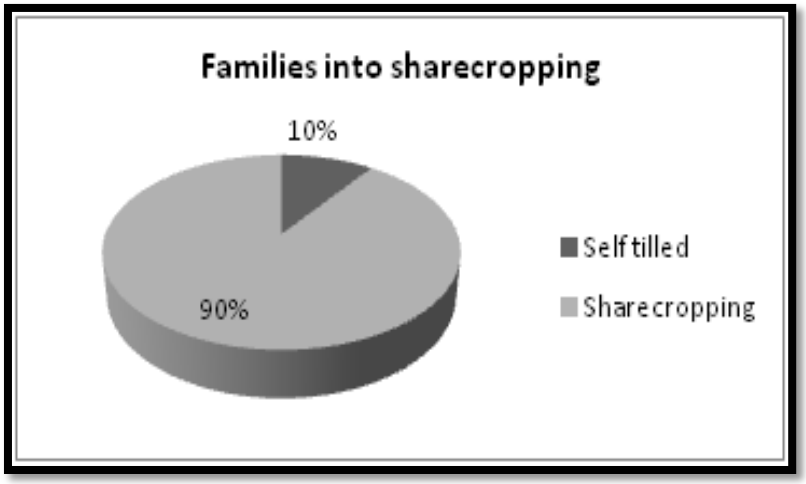
Crop	Jan	Feb	Mar	Apr	May	Jun	July	Aug	Sep	Oct	Nov	Dec
Paddy					LP	N	N	W	W	H	H	
Ginger	H		LP	P	E							H
Vegetables	H	H							LP	N	T	
Creeper Vegetable					LP	P		H				
Maize				LP	P	W		H	H			
Banana		H	H	LP	P		W					
Tea			P	P	W		W		W		W	

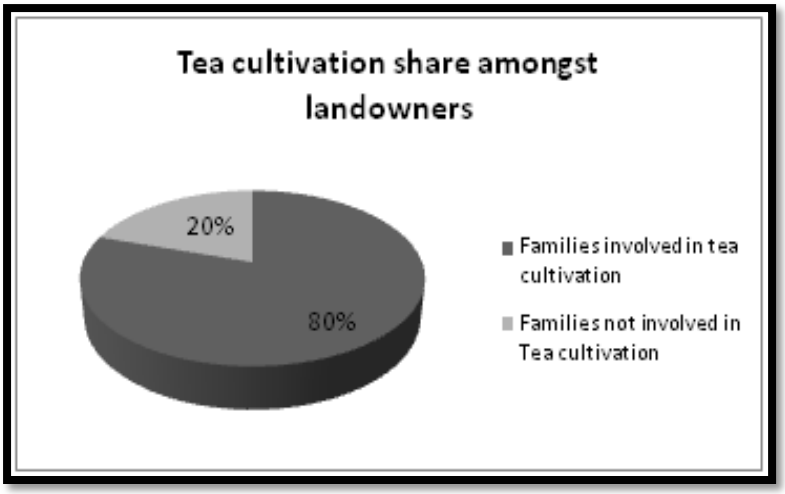
*C= Cleaning, LP= Land preparation, S= Sowing, N= Nursery, T= Transplantation, E= Earthening up, W= Weeding, H= Harvesting, HP= Peak Harvest

Village: Nangpo

Livelihood portfolio analysis – profiling:

Nangpo is a village at a distance of 12 Kms from the District HQ. This is a village, which for us is distinct because of 2 reasons. The huge swathes of Tea gardens, which greet us as soon as we enter the village and also the large numbers of Adivasi families living in the village. Families here practice both the two majorly prevalent livelihood systems mentioned in the document. (a) Paddy based and (b) Paddy and Tea based. The Arunachali tribes are majorly dependent on the second livelihood system whereas the Adivasis are dependent on the first system with the added vulnerability of having no land documents for the land that they till. There are examples of families amongst the Adivasis who have "bought" land from the Arunchali tribes and till it but most of them are medium uplands with limited productivity. Most of them are still dependent on sharecropping.





Community perspective on challenges and scope:

The Arunachali tribes have landholding and have a sizeable income coming from Tea farms but it is the Adivasis who have to be dependent on sharecropping, agriculture labour work available in the village and sale of small ruminants during emergencies t o sustain their livelihoods. Most of them have shared that they are living here n the basis of ILPs which the govt issues from time to time although they have been living in the village for at least 3 to 4 generations. There are some farmers from the Adivasis who have taken up some small scale vegetable and horticulture on leased land but lack of irrigation facilities are a major impediment in this kind of livelihood options. The Arunachali tribes have been seen in experimenting with many other crops as well like organic vegetable cultivation.

People preferences and choices

Prioritization of Activities

Type of LH	Product/Activity	Number and % HH engaged	Remunerativeness (high, med, low)	Risk (high, low, medium)	People preferences/choice (ranking)	Scope	Limitations/challenges
Farm Based	Paddy	100	M	L	H	Scope for productivity enhancement	Varieties and low penetration of new technologies and techniques
	Maize	100	M	L	H		
	Vegetables	100	M	H	H	Scope for expansion in the no of families involved (esp Adivasis)	Lack of irrigation facilities.
	Horticulture (banana, betelnut)	100	H	M	H	Scope for bringing higher returns by adopting sustainable practices	
	Spices (Ginger, Turmeric)	>60	H	M	H	Higher returns by organising sales. Opportunities like the spice board exist but aggregation issues have to be addressed.	Individual sales and therefore varying returns. This can be addressed by organising collective sales to buyers such as the spice board or others who buy in bulk.
Non farm	Petty business	<20	H	L	L		
	Livestock rearing	60	H	M	H	This is done only by the Adivasis as most other Arunachali tribes are Buddhists and	There is a definite scope for enhancing veterinary services to capture more value for the families.

					culturally as well as religiously they are against animal slaughter.
	Labour	60	L	L	L

Major problem shared by the members	**Knowledge about newer techniques is hard to come by** **Irrigation options for Adivasis push them away from more remunerative practices.** **Veterinary services very limited and therefore very difficult for families to acces them.**
Members perspective on improving the livelihoods	As far as the Adivasis are concerned they realize they can only improve their status by "buying" land. Some of them have done the same and are now cultivating in their "own" lands. There are families who have also constructed small dwelling unit for goat rearing too which they think is a life saving option during crises.

Profitability of Tea

Tea Production

Tea is one of the major commercial crops in Namsai block. Tea cultivation is labour intensive, it needs high investments in initial year however it gives a very steady income has over the years and plantations can give yields up-to 40-50 years. Sloppy well drained loam soils are good for tea plantation, should be dry in nature. On an average a mature tea plantation has potential to give Rs 30000-35000 per bigha for the farmers.

It starts giving fresh leaves from 18 months onwards, for the first year production is low, 50-60 Kg fresh leaves per lifting per bigha which is 3-4 times when the plant becomes mature. 3-4 plucking are done in a month and it is done for 7-8 months starting from the month of March to October, the rates are at pick during first 2 months, rs 22 per kg but its gets as low as 3-4 rs per kg during September October.

Tea Plantation Profitability Analysis

Cost Items	Year-1	Year-2	Year-3	Mature Plant
Clearance of Land	10000	0	0	0
Ploughing at least for 5 hours with tractor	3500	0	0	0
Leveling at least 1 hour ploughing and 1 labour	1000	0	0	0
Planting material@ Rs 10 per plant, 2000 plants per Bigha	20000	0	0	0
Labour for planting 3 labours for 1 bigha	900	0	0	0
Manual weeding for first 6 months with 2 labours (2x 2 timesx300)	1200	0	0	0

Weedicide application @ 5 litres for first year and 10 litres in consecutive years	1500	3000	3000	3000
Pesticide application@ 5 litres for first year and 10 litres in consecutive years	1500	3000	3000	3000
Application of urea 200 Kg per year in 2 splits	0	2000	2000	2000
Application of MoP 100 Kg per year in 2 splits	0	1500	1500	1500
Labour days for weeding, weedicide application, pesticide application@ 3 Labour days per month on an average	0	3600	3600	3600
Harvesting Rs 2 per kg of fresh leaves	3360	6720	10080	10080
Total Cost	42960	19820	23180	23180
Production per year	1680	3360	5040	5040
Average price (Maximum 22 and minimum 4)	12	12	12	12
Gross Profit	20160	40320	60480	60480
Net Profit	-22800	20500	37300	37300
Cumulative profie	-22800	-2300	35000	72300

Cropping system and seasonality analysis

Crop	Jan	Feb	Mar	Apr	May	Jun	July	Aug	Sep	Oct	Nov	Dec	Remarks
Paddy					LP	N	N	W	W	H	H		
Ginger	H		LP	P	E							H	
Vegetables	H	H							LP	N	T		
Creeper Vegetable					LP	P		H					
Maize				LP	P	W		H	H				
Banana		H	H	LP	P		W						
Tea			P	P	W		W		W		W		

Cropping system and seasonality analysis

*C= Cleaning, LP= Land preparation, S= Sowing, N= Nursery, T= Transplantation, E= Earthing up, W= Weeding, H= Harvesting, HP= Peak Harvest

Village: Nongthao Khamti

Livelihood portfolio analysis – profiling:

This is a village which is characterized by its location. It is a fringe village which is the last village before entering into a new district ie Chakhesang. It was observable that both systems of livelihoods are practiced over here. This is village with 105 Khamti families and 8 Tea tribe families. There is a substantial percentage

population which are illegally involved in the cultivation of Opium which is a major contributor in the village economy. Again sharecropping is a major template for agriculture with Chakmas form the neighbouring Chakhesang distt. working as agri labour. Paddy productivity like in other areas is again low pegged at around 3.5 to 4.0 MT per Hactre

Community perspective on challenges and scope:

There is hardly any application of chemical fertilisers in the paddy fields but there is an infestation of pests such as the Gandhi Bug which affects the crop. There is scope to enhance the productivity of paddy and vegetables by improving seeds as well as cultivation practices.

People preferences and choices

Prioritization of Activities

Type of LH	Product/Activity	Number and % HH engaged	Remunerativeness (high, med, low)	Risk (high, low, medium)	People preferences/choice (ranking)	Scope	Limitations/challenges
Farm Based	Paddy	75	H	M	H	There is scope for enhancing productivity and yield.	The excessive dependence on labour from Chakmas might mean a stumbling block in bringin in new techniques.
	Potato	90	H	H	H	Scope for enhancing yield and marketing from the long distance	
	Banana	90	H	M	H		
	Vegetable cultivation	>50	M-L	H	M-H	Marketing support can be major intervention	
	Pineapple	>50	M	H	M		

Off farm	Cow	100	-				
	Pig	80	H	M	H	Animal health is a major issue	Very limited veterinary services in this remote pocket.

Major problem shared by the members Not many as the economy is run by the Opium cultivation which contributes majorly to the economy.

POP analysis of selected crops: Paddy

Crop	**Paddy**
Area	
Pre Sowing /transplantation	
1. Field preparation	Done using power tiller and also in some villages by bullock, 3 ploughing is done and then leveling is performed.
2. Seed sourcing	Ranjit, Bihari, local-bora, joha, bordhan
3. Seed rate:	35-40 Kgs per Ha
4. Seed Treatment	Seed treatment is not done
5. Seed Varieties and duration	
Sowing/transplantation	
1. Technique	Seeds are mostly sown in nursery and than 30-40 days old seedlings are transplanted in case of low lands whereas in uplands seeds are broadcasted and the seed rate is as high as 50-60 kg per hactre
2. Basal dosage (fertilizer):	No fertilizer is used in paddy
3. Top dressing (fertilizer):	
Plant management	
1. Weeding	Manual weeding is done, twice for transplanted rice and no weeding is performed in case of broadcasted paddy
2. Earthing up	
3. Irrigation/Moisture conservation	Field bunds are practiced in all paddy fields

4. Major Pest attack in last five years and its management	Rice gundhi bug is prevalent however not much of control measures are used for controlling gundhi bug
Diseases and its management Application of nutrient	No disease and pest management practices are followed in case of paddy
Harvesting &Post harvesting	
1. Harvesting method	Manual harvesting is done using sickle
2.Drying/Storage/ Grading /Packaging	
Yield	3.0- 3.5 MT per Hactre in case of transplanted paddy and 1.5 MT to 2.5 MT per Hactre in case of broadcasted paddy

Productivity and Cost benefits analysis of selected crops

Crop		Production cycle	
Unit area		**Bigha**	
Sl No	**Particular**	**Rate/ detail**	**Amount (Rs)**
	Set up cost		
1	Purchase of land	Per bigha it costs around 5000-10000/- but no land ownership transfer done legally	10000
	Variable cost		
1	Seed	10 Kg seed for one bigha, per kg cost is Rs 30	300
2	Ploughing	5 times with bullock, Rs 200 per unit	1000
3	Irrigation	1 to 2 times depending on rainfall	600
		Total cost	**11900**
Production		8 mon per bigha, 320 Kg	
		Gross Income (320 Kgx Rs 12 per Kg)	**3840**
		Net income = (Gross- Variable cost)	**1940**

Pig rearing activity:

In livestock production, pig rearing is one of the most common activity in this village, almost 80% hh are engaged in pig rearing, however pig rearing practices are mostly traditional in nature, breed selection is not properly done, some local measures based on their experience is practices while breed selection and other husbandry practices. No de-worming or vaccination schedules are followed by the rearers.

Pig rearing

Livestock	**Production cycle**
Unit area	**1 piglet for fattening**

Sl No	**Particular**	**Rate/ detail**	**Amount (Rs)**
	Variable cost		
1	Piglet	1 number, 2months old piglet	4000
2	Feed		6000
		Total cost	**10000**
Production		9 months of rearing, piglet becomes 80 Kg fresh body weight	
		Gross Income (80 Kgx Rs 200 per Kg)	16000
		Net income = (Gross- Variable cost)	**6000**

Cropping system and seasonality analysis

Crop	Jan	Feb	Mar	Apr	May	Jun	July	Aug	Sep	Oct	Nov	Dec	Remarks
Paddy					LP	N	N	W	W	H	H		
Ginger	H		LP	P	E							H	
Vegetables mostly Potato	H	H							LP	N	T		
Creeper Vegetable					LP	P		H					
Maize				LP	P	W		H	H				
Banana		H	H	LP	P		W						

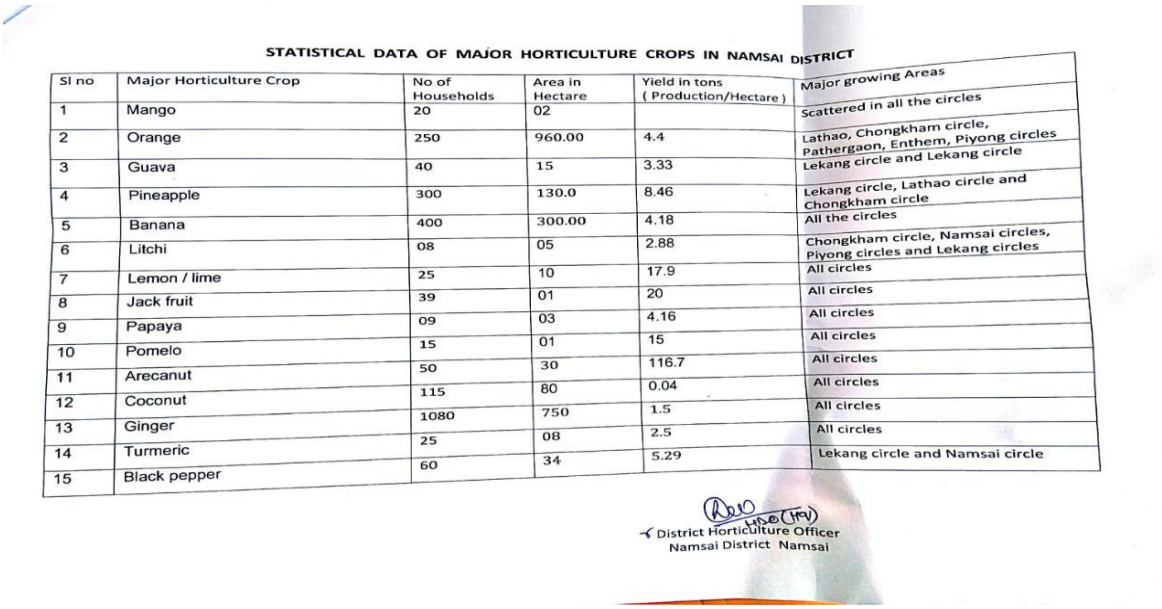
*C= Cleaning, LP= Land preparation, S= Sowing, N= Nursery, T= Transplantation, E= Earthing up, W= Weeding, H= Harvesting, HP= Peak Harvest

Interaction with agriculture department

Name of Dept.	Agriculture
Name and designation, contact no of the person	
Current scenario in production/post production – challenges/success	Soil is deficient in N,P and K. Dept. Is distributing bio-fertilizers and bio-fungicides. Soil PH is favourable for production (5-6). Rubber cultivation has been started by few farmers. Dept has tried to promote SRI however adoption rates are very low. Current paddy productivity is 22-25 q/ha in WRC.
New technology/varieties	Dept. Promotes and encourage farmers to produce MTU -7029 which has production of 30-35 q/ha. IR-64 and IR-08 are the other varieties. Dept. Suggest use of Varuna M-27 mustard seed for better production. For Maize HQPM-HYV but farmers do not prefer HYV.
Major diseases and pest and controlling mechanism	No such major diseases and pest infestation, only leaf hopper, roller and Gundhi-bug.
Soil quality, deficiency of nutrient	No use of external inputs in paddy and maize.
Ongoing program/schemes	RKVY, NFSM, mission organic, Pradhan Mantri Krishi Sinchayee Yojana
Major challenges in technology transfer	Farmers are not ready to change their variety, change in practices is difficult if it is labour intensive.
Scope of convergence	Not mentioned

Interaction with Horticulture Department:

1. **Production data of major horticultural crops in the district**



STATISTICAL DATA OF MAJOR HORTICULTURE CROPS IN NAMSAI DISTRICT

Sl no	Major Horticulture Crop	No of Households	Area in Hectare	Yield in tons (Production/Hectare)	Major growing Areas
1	Mango	20	02		Scattered in all the circles
2	Orange	250	960.00	4.4	Lathao, Chongkham circle, Pathergaon, Enthem, Piyong circles
3	Guava	40	15	3.33	Lekang circle and Lekang circle
4	Pineapple	300	130.0	8.46	Lekang circle, Lathao circle and Chongkham circle
5	Banana	400	300.00	4.18	All the circles
6	Litchi	08	05	2.88	Chongkham circle, Namsai circles, Piyong circles and Lekang circles
7	Lemon / lime	25	10	17.9	All circles
8	Jack fruit	39	01	20	All circles
9	Papaya	09	03	4.16	All circles
10	Pomelo	15	01	15	All circles
11	Arecanut	50	30	116.7	All circles
12	Coconut	115	80	0.04	All circles
13	Ginger	1080	750	1.5	All circles
14	Turmeric	25	08	2.5	All circles
15	Black pepper	60	34	5.29	Lekang circle and Namsai circle

District Horticulture Officer
Namsai District Namsai

Name of Dept.	**Horticulture**
Name and designation, contact no of the person	
Current scenario in production/post production – challenges/success	Huge area of upland. Huge potential to grow cash crops. Ginger is produced in scale; pineapple, orange as well as banana are also grown in some areas. Scope for vegetables and floriculture is high
New technology/varieties	Dept has tried to promote Banana cultivation, rubber as well as high density pineapple cultivation. Some farmers are adopting these practices.
Major diseases and pest and controlling mechanism	Not mentioned
Soil quality, deficiency of nutrient	No use of external inputs except in case of Tea
Ongoing program/schemes	National horticultural mission is going on
Major challenges in technology transfer	Production practices are not scientific hence productivity is low
Scope of convergence	Not mentioned

Interaction with Local Market: Namsai

Features	Namsai
Type	Primary
Periodicity	Daily
Size (Retail, Wholesale)	No of wholesaler- 03 Wholesalers For local products villagers directly come and sale to the retailer, retailer- around 25-30 (local women), 20 who have permanent shops (outsider).
Major vegetable/other products supplied (quantify) **A) targeted block –** **B) Other area (mention)**	In a week 4-5 tons of vegetables are brought by wholesalers from Tinsukia market and it is distributed to 15 retailers who sale the vegetables in the local market. Local people don't consume outside vegetable much mostly the employees of govt and private sector staying in Namsai are major consumers of vegetables.
Peak Demand period	April-Sept when local vegetables are not available, local vegetables are there from October to February
Peak Supply period	Oct-Feb almost all varieties of winter vegetables are grown in the local area which is mostly grown by Assamese community who take land from local farmers on lease.
Supply Chain	Ginger is the only product which mostly goes out from the district, it mostly goes out to tinsukia market. 4-5 aggregators are there in Namsai who collect the product from different villages and sends it to Tinsukia.
Supply to places	Local markets in Assam and Tinsukia for wholesale
Challenges faced by retailer, wholesaler	As local people prefer to consume their own produce, mainly leafy vegetable, demand of other vegetable are less, very small town consumption are very less. Local resident also prefer to buy vegetable on weekly market (Sunday) when local growers directly sell their produce in the market so demand on other days (weekdays) are very less.
Recommendation by wholesaler/retailer on product quality, procurement,	The market size in Namsai is very small. But in peak production period like Oct-January, scope is limited for consuming large quantity of vegetable. So its limits the scope for area expansion but is sizable production happens, it can be supplied to Assam,

transportation, handling etc.	particularly Tinsukia but it would compete with production cluster in Assam as it will have very less transportation cost involved.
Scope of intervention	Village level aggregation, encouraging local entrepreneurs/traders to access Tinsukia market specially in horticulture crops like Ginger, Orange and vegetables.

Recommendations

1. **Huge scope for intensive vegetable farming-**

In almost all the villages, 15-20% of the uplands are observed remain fallow for the entire year, soil is virgin with very less usage and exploitation. These lands can be easily converted into high value cash crops-vegetables mainly as there is a big transit market in Tinsukia. As of now supply to Tinsukia market comes from central and lower Assam at high transportation costs whereas if Namsai is promoted as vegetable belt it can easily provide volumes of vegetable at cheaper rates in this market owing to physical proximity. A minimum additional value of around of almost 30 to 35% for the farmer can be expected by sales to Tinsukhia.

2. **Scope for developing fruit cultivation models-**

Soil is good for growing different horticultural crops, sandy loan soils with good drainage has a potential of producing crops like Banana, lemon, mango, litchi etc. Some irrigation source for live saving irrigation during summers and 0.3-0.5 Acre of well planned fruit cultivation can boost economy of the farmers.

3. **Productivity enhancement in paddy**

Paddy yields can be improved by introducing practices like lowering seed rate, spacing, line transplanting, and mechanical weeding. Now yields are low 2.0-3.5 MT/ha

4. **Improving husbandry practices in livestock**

Huge potential for improving breed shed and vet care for pig as well as goat. Demand is high but husbandry practices are not scientific and farmers are unable to tap the potential of enhanced income through productivity enhancement.

5. **Producer group and higher level integration in case of tea, ginger crops which are already produced in clusters**

In case of tea, lot of rate fluctuation during peak production season, low negotiation power of the small growers, tea grower associations can resolve many issues in terms of lowering the input costs through bulk procurement, supply of fresh leaves to the processing units directly. This type of interventions are to be planned after concrete understanding of the sector and further studies on pros- cons of entering into Tea business. However it seems to have huge potential. Skill-set improvement of tea growers one more area needs to be taken care of.

Secondary data about the district and block

Before collecting the primary information from the field, the study team collected basic demographic, physiographic, agro-climatic condition, cropping pattern from secondary sources.

Demography

Lower Dibang valley district is the 15th district, located in the eastern part of Arunachal Pradesh. The district is bounded on the North be Dibang Valley district and China, on the east Lohit district, on the west East Siang and Upper siang district.

The district is having an area of 3900 sqkm and accounting 4.65% of the total state land with a population of 54,080 person (4% of the state population). As per census 011, the population density is 14 persons per sq.km. There 316 villages and 11600 households. The district has 3 CD blocks (Roing-Koronu CD Block, Dambuk-Paglam CD Block and Hunli-Desali CD block) and 7 administrative circles. Roing circle has 67% population of the district.

Total population	Total households	Male	female	0-6 years children	ST	Inhabited Village
District						
54080	11600	28053	26027	8009	25974	264
Roing-Koronu CD block						
41996		21881	20115	4715	16485	166

Physiography

The topography of the district has mountains, plain hills with low altitude and plain land area. The northern part of its falls within higher mountain zone consisting of tangle peak and valley. The foothills range lies in the southern part having plain hill with low altitudes. The area under Roing, Koronu, parbuk, dambuk and paglam

circles are plain land. Mayudia being developed as hilly resort which is situated at a distance of 56 kms from Roing at a height of 8629 ft. It covers with snow in winter.

Soil

The soil taxonomy of the district has been identified into three major classes; Soil of undulating upland, soil of gentle slope, soils of level to nearly level flood plain.

Zone	Soil characteristics	Area (ha)
Soils of undulating upland	Moderately shallow to deep, dell drained, loamy or coarse loamy in texture with moderate to severe erosion hazards. The soils are strongly to moderately acidic in nature (pH 4.5 to 7.2), rich in organic matter (0.8 to 5.2% organic carbon) which decline sharply with depth.	4715
Soils of gentle slopes	Deep, well to imperfectly drained, fine/ fine loamy/coarse loamy or coarse silty with moderate erosion and slight to moderate flood hazard. Soils are moderately to slightly acidic (pH 4.6-5.8) and moderate to high in organic matter content (1.3-3.7% organic carbon).	11779
Soils of level to nearly level flood plain	Deep, well to moderately well drained, coarse loamy to coarse silty with moderate flood hazard. Soils on channel bars are moderately shallow, excessively drained and sandy in texture. Soils are slightly acidic to alkaline in nature (pH 5.5-8.4).	7073

Agro-climatic condition

The agro-climatic Zone as per Planning Commission is Eastern Himalayan Region, Zone-III and Sub-Tropical and Sub-Humid as per NARP. So The district has a sub-tropical climate. The district experiences very heavy rainfall from March to August. Total rainfall recorded at Roing is 6642.32 mm during 2012. The lower belt of the district experience hot climate in summer. The northern belt of the district i.e. Desali and Hunli circle, enjoy very moderate climate during summer and extreme cold during winter. The average number of rainy days is 170 days.

Table 1. Climate of Lower Dibang Valley District

Sl. No	Agro-climatic Zone	Characteristics
1	Sub – tropical Plain Zone	The Climate is characterized by hot summer and moderately cool winter. The mean annual rainfall varies from 2590 – 3390mm and it exceeds PET greater part of the year and soil remains dry only for a month or so. Mean annual soil temperature is 22^0 C or higher.
2.	Mid tropical Hill Zone	The climate is characterized by mild summer and moderate to severe winter. The mean annual rainfall ranges between 2000 to 5000 mm and it exceeds PET for most part of the year. The mean annual soil temperature varies from 18 to 22^0C.

Source : District Statistical Office, Lower Dibang Valley

Forest

Forest reserved area of Lower Dibang Valley District is mostly situated in the hilly region and it has also entered upto the river bank of the plains. Forest plays an important role for earning revenue for the district and earning livelihoods for people.

Table 2. Details of forest of Lower Dibang Valley

Reserved Forest area	610.78 sq.kms
Proposed Forest area	53.5 Hect.
Unclassified state forest	2822.23 sq.kms
Wild life sanctuary	281.50 sq.kms

Source : District Statistical Office, Lower Dibang Valley

Land use pattern of Lower Dibang Valley district

Total geographical area (ha)	Gross cropped area(ha)	Net sown area (ha)	Area sown more than once (ha)	Cropping intensity (%)
390000	44050	35805		

Crop wise area, production and productivity of Lower Dibang valley district, Roing (2016-17)

Crop	Area in Ha	Production in MT	Yield in Qtls	Remarks
Kharif crops				
Rice TRC	11500	23000	20	

Rice Jhum	3110	3110	10
Maize	7550	11325	15
Millet	1530	1377	9
Buck Wheat	340	544	16
Pulses (Bean, Blackgram, Pea, Arhar)	1100	1664	
Ginger	3050	27450	90
Turmeric	120	1080	90
Vegetable(Summer)	410	1148	26
Rabi			
Oil seeds –Mustard	5400	5400	10
Potato	370	3330	90
Maize (Rabi)	730	1022	14
Vegetable (Winter)	470	1222	26
Total	**35680**		

Source: Deputy Director, Agriculture, Lower Dibang Vally district, Roing

Primary data collection

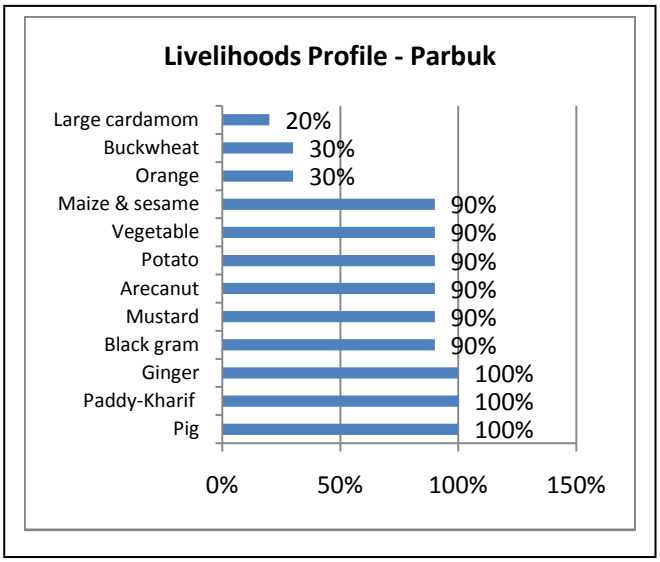
The study collected information of the block from the block staffs in terms of households, community, remoteness of villages, cropping pattern of different villages. Based on this the study team identified villages (sample) for conducting the primary level information on livelihood. The team analyzed the demographic information of the villages and identified villages which represent the block in terms of diversity of livelihoods/ cropping pattern/terrain/ community/ poverty/remoteness/ backwardness etc.

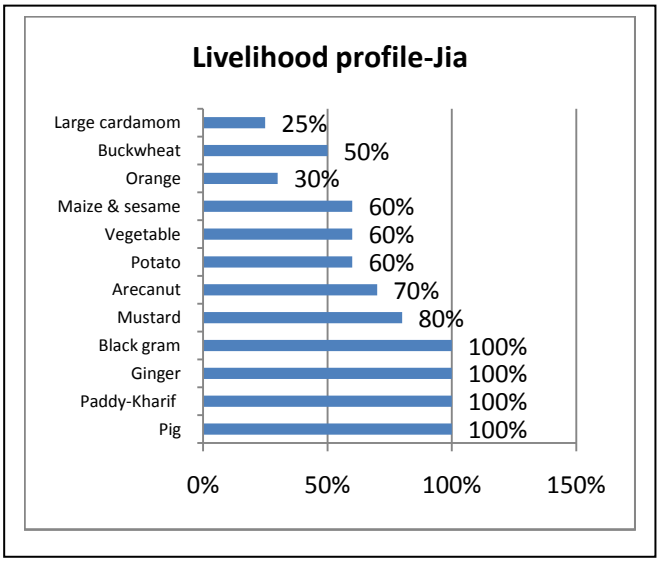
Village	Features	Remarks
Parbuk & Jia	• Well connected with block HQ, Situated adjacent to the main road. • Intensive agriculture, most of the family engaged in Paddy, ginger, Oilseed, pulses and vegetable • Livelihoods pattern-representative of blocks for Adi community	**Sample Village-1&2**
Denllo	• More intensive oilseed and millets • Community different –Idu Mishmi • Community do not prefer to be engaged intensively in agriculture, Engage Nepali and Assamees as share cropper	**Sample village-3**
Eduli	• Comparatively remote village • Oilseed, Maize and millets production • Idu Mishmi community	**Sample Village-4**

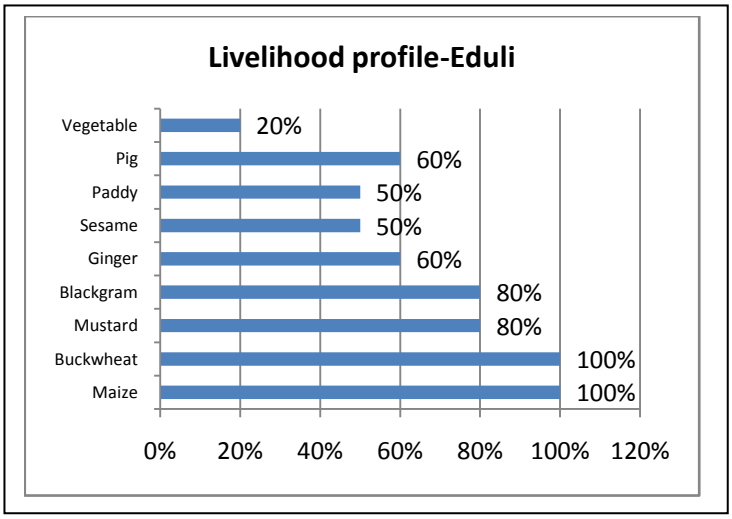
- Community do not prefer to be engaged intensively in agriculture, Engage Nepali and Assamees as share cropper

Livelihood profile

ArSRLM has promoted SHGs with good coverage of households in villages at Roing block. The major livelihoods are agri-Horti based. The livelihoods profile of three sample villages is given below. (% of HH in each livelihood)







Resources

Type of Land and its use

The land in Parbuk and Jia village are almost plain land but it can be broadly divided into two categories. Upland which are mainly used for Oilseed, pulses, maize, ginger, buckwheat cultivation. Low land are used for paddy cultivation. Those who have sloppy land they cultivate large cardamom.

Resource –livelihoods and infrastructure trends in last 30 years

The study team had focus group discussion with SHG members in Denllo village to understand the changes in infrastructure, resources and livelihoods pattern in last 30 years. The discussion points are given in the following table.

Timeline	Infrastructure	Resources	Livelihoods	Problems
30 years	5-6 families came from Anini side and settled in the village, stayed in a single home There was no road, no water and electricity	Entire area was forest area, mostly bamboo and trees Lot of animals, mostly elephant, monkey and leopard was there No source of water, people used to collect water from leaf, root extract, there was stream called inju nalah but round the water was available Land was covered with bushes and forest, people cleared forest to create paddy land (mostly undulating upland)	Food –Paddy, bamboo shoot, roots Agriculture- only paddy and jhoom cultivation	No water, road, electricity Diseases- Malaria, no medical facility, people used to walk to Roing where some medical facility was available
20 years	There were 50 HH, Roard was kuchha, pipe line was there for water but availability was very uncertain, village got electric connection, 1 primary school was constructed, awanwadi centre started, one overhead tank was constructed but never functional	Forest- mostly trees Animal- few wild animal, people started raring pig, hen etc Water- pipe water, inju nallah and overhead tank (not functional) Land- people started levelling their land	Food- Paddy, leafy vegetable from forest, started cultivation of leafy vegetable, root crops Agriculture- people started intensified agriculture – Paddy, Ginger, mustard, buckwheat, maize but mostly done without tillage People also started cultivation Large Cardamom	Drinking water Road condition was poor Diseases – malaria, typhoid, dysentery

10 years	75 HH, one middle school started, Church in the village, second Awanwadi started and ASHA workers started working in the village.	Forest – No more forest Animal- no wild animal, people also started raring goat and cow, pig in intensive way. Land- entire forest land converted into agriculture land Water- pipe water (not regular), overhead tank –not functional	Agriculture- started mechanization, use of tractor for ploughing Major crops- Paddy, Mustard, Buckwheat, Maize, Ginger, potato, cabbage Started horticulture plants-Orange, pineapple, area under large cardamom increased	Drinking water As agriculture got intensified people started facing problem in irrigation
Now	83 Households, Panchayat office started, pucca road	Forest- No forest Animal- no wild animal, people also started raring goat and cow, pig in intensive way. Land- entire forest land converted into agriculture land Water- pipe water (not regular), overhead tank –not functional	Agriculture more intensified, less jhum cultivation People started cultivating new paddy varieties (short duration) Vegetable production increased, Large cardamom cultivation increased, orange, pineapple cultivation decreased.	Drinking water Irrigation problem Less agricultural land for each family

Water sources

The water requirement for drinking and domestic purposes in the block is mainly met with from the surface water sources like streams and nallas. Each village has supply water but supply is not adequate. Availability of drinking water has been identified as major problem in Denllo. There are very less effort has been made for surface water conservation and irrigation is almost nil in all sample villages. Though there is a stream near Parbuk and Jia village, farmers do not lift water for agriculture purpose. In Eduli the water table is very near, due shallow ground water structures, dug wells down with depth of 10 to 20 m is sufficient and many households have dugwell which is mainly used for household purpose. Shallow tube wells with depth of 15-20m are also common. But the scenario in Denllo is different, hand pump is not functioning, water table is far below. The foothill zone is suitable for the development of ground water through structures like dug wells, hand pumps and shallow tube well. Entire

area has good potential for developing rain water harvesting structure for agriculture purpose.

Agriculture and horticulture scenario

Though the agriculture in the block mainly depends on monsoon, agriculture scenario are quite different from other blocks like yachuli and pangin. More intensive agriculture is practiced by farmers. Agriculture practices and cropping pattern in all villages are very similar but intensity are different in villages, particularly among community. Idu Mishmi community, do not prefer to be engaged intensively in agriculture, they engage Nepali and Assamees as share cropper. While Adi community are more engaged in growing all varieties of crops. Roing is a hub for oilseed (mustard and sesame) and pulses (blackgram). Buckwheat is another crop grown by all farmers. Farmers do not use any external inputs for nutrient and pest management. Jhum cultivation is gradually becoming less popular. Area under large cardamom is increasing day by day. Though mechanisation, particularly use of tractor is popular but demand is very high and this is one of the major concerns shared by the farmers. Looking at the large scale cultivation of maize, oilseeds and pulses, there are enormous scope of mechanisation in other aspects. Palm oil plantation is recently getting popular in Roing block but mostly adopted by farmers having large land holdings. The major field crops are....

Paddy : Kharif paddy is grown in the area. Adi community in parbuk and Jia villagedo paddy cultivation intensively, while in Denllo and Eduli paddy is relatively less as they have less wetland for paddy cultivation. Farmers prefer to grow local varieties like pasighat, Punjab lai, Laijubi, amkel etc. which are 120 days variety. Agriculture Dept. encourage farmers to adopt high yielding varieties like MTU-29, IR-64 and IR-08. Farmers do not use any external inputs.

Maize: Maize is also cultivated in large areas. Second largest in terms of area and productions. Local variety is mostly grown. It is more resistant and plant do not fall in mature stage, while in hybrid variety plant mostly fall in mature stage due to wind. Farmers sow maize in two different seasons. In Kharif maize is sown during March-April and Rabi season in Sept.

Vegetable: Vegetable cultivation are most intensive in Parbuk, Jia than Denllo and Eduli. Scenario in Eduli is different. Though community is not engaged in vegetable cultivation they gave their land for vegetable cultivation to Nepali and Assamees on share. These people grow vegetable on commercial basis.In Parbuk and Jia most of the families grow leafy vegetable, chilli, pumkin, Brinjal, potato, cucumber and coriander. Almost every family grows vegetable for their own consumption and surplus they sold it to Roing market. Traders from outside (Assam) aggregate the produce at the village level and take it to Roing and neighbouring markets in Assam. Vegetable growers in Eduli, directly take their produce to the Roing market and sell it to retailers.

Ginger: All farmers grow ginger in Parbuk and Jia but it is done in lesser area in Denllo and Eduli and farmers are also less in number (60% in Eduli). Farmers follow

their traditional methods of cultivation with rhizome from same source years after year. Farmers grow ginger in upland. Ginger is transplanted in the month of March and harvested in Jan-Feb. Intercultural operation mainly weeding and land preparations are the major investment area. The area under ginger cultivation is getting reduced day by day. It is mainly due to marketing problem. The production risk (ginger rot) is also increasing.

Oilseed and pulses: Roing is a hub for oilseed (mustard and sesame) and pulses (blackgram). Mustard is grown on a large scale in Denllo and Eduli area. Oilseed and pulses are the most preferred crops by farmers. No external inputs are used on the field. Farmers prefer to grow these crops commercially because these are short duration, no major investment, less labour intensive and the supply chain is established. Few farmers adopted very good practices of crop rotation. Farmers grow mustard, blackgram in October, paddy in June-July and followed by Maize. As it is rainfed, crops often lack a critical irrigation during flowering, particularly mustard.

Buckwheat: Buckwheat is also very popular commercial crops; it is grown for consumption and sale. The production area is gradually increasing. All farmers in Eduli and Denllo village grow buckwheat whereas it is grown in less area in Parbuk (30% farmers) and Jia (50%). Buckwheat is also preferred by farmers as there is less investment, less labour intensive and the supply chain is established.

Agriculture trend in Denllo village

Crop	Area	Production	Productivity
Paddy	↓	↓	↓
Buckwheat	↑	↑	↑
Mustard	↑	↑	↑
Maize	↓	↓	↓
Blackgram	↑↑	↑↑	↓
Ginger	↓	↓	→
Orange	↓	↓	↓
Large cardamom	↑↑	↑	→
Vegetable	↑	↑	↑
Mustard	↑	↑	→

Agriculture seasonal calendar

Crop	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Maize	H	LP	S	S		W		W	W			H
Paddy				LP		N	P	P			H	H
Black gram	H							LP	S			
Mustard & Buckwheat	H	H							LP	S		
Ginger	H	LP	S	S		W		W	W			H
Potato			H					LP	S	E	E	

*LP= Land preparation, S= Sowing, N= Nursery, P, Plantation, T= Transplantation, E= Earthing up, W= Weeding, H= Harvesting,

Production practices, productivity, issues, challenges in major crops

Crop	Production practices	Challenges shared by SHG members
Paddy	**Production practice** • Farmers grow paddy on valley land and practice WRC(Wet rice cultivation) • Many families give land for share cropping. • All the family follow traditional practices but most of the family transplant single/two seedling. • Age of seedling varies among farmers 25-30 days • Seed rate varies • Seed replacement is low, farmers prefers local variety • Seed treatment not in practice • Farmers do not use any external inputs. **Productivity** As farmers are not aware of the measurement of their land it is difficult to measure the productivity of paddy. Pura is the local unit (240ftx240ft) which is almost 0.5 ha. Which is used by the farmer but they go for eye estimation. However a rough estimation indicates the productivity in the range of 1200 to 1400 kg per acre i.e. 3000 – 3500 kg/Ha (parbuk village). However the district average productivity 2000 kg/ha (2016-17 agri. Dept. Data) This is lower than the productivity can be achieved in line transplantation or SRI (4000-5000 KG/Ha)	• Water crisis during transplantation- On time sowing/transplantation is a major challenge as it is rainfed agriculture. • Mechanisation – availability of tractor. • Disease and pest – Leaf hopper/roller and gundhi bag, fungal attack
Ginger	• Farmers are using same rhizome years after years and no varietal change • Use local variety smaller rhizome. • No external inputs are added on land • Most of the Farmers do line sowing, maintain a distance of 12 inch and 3-4 inch seed to seed, put rhizome at a dept of 4-6 inch. • Seed rate varies among farmers (depends on the land position and soil type) • Preservation of rhizome – keep in shade and covered with leaves	• Investment is high but low return • Lack of capital • Fungal attack- ginger soft rot • Heavy rainfall damages the production • Farmers get very low rate of their produce and gradually no of farmers are decreasing.

	Productivity Production related data are available but as land measurement is a real difficult proposition, study team explored the conversion rate like how much rhizome was used how much produce harvested. It was noted that the conversion ratio was 1: 6 or 6.5. This ratio is at lower side as this may be increased upto 1: 8	
Oilseed and pulses	• Large area are under oilseed and pulses, farmers are not very concerned about productivity • After sowing there is no intercultural operation particularly in blackgram, no cleaning is done. • Local variety seeds of mustard are used, seed rate varies as the farmers use eye estimation of the land • Farmers also shared that use of organic inputs/compost will not be feasible for such huge area. **Productivity :** As per the Agriculture Dept. Data yield of mustard is 10 quintals per ha which is little less than national average 1184 kg/ha.	• Non availability of labour for harvesting • Lack of water (irrigation at critical phases like flowering) • Diseases (white patches)
Vegetable	• All tribal families grow Vegetable leafy vegetable like lia patta, chilli, king chilli and pumpkin which are mostly grown for the purpose of own consumption and no external inputs are used but sharecropper who grow commercially use chemical fertilizers. • Vegetables are mostly grown during winter i.e. from October to March, Vegetables are supplied from outside during April to September. • Oct-Feb almost all varieties (Brinjal, potato, cucumber, Cabbage, cauliflower, tomato and coriander) of winter vegetables are grown in the local area which is mostly grown by Assamees community who take land from local farmers on lease.	• Lack of technical knowhow and irrigation facility • local people prefer to consume their own produce, mainly leafy vegetable, demand of other vegetable are less, very small town consumption are very less • Disease and pest • Storage of potato
Livestock-Pig	• Almost all households rare pig • Open grazing is the most common practice • Very few farmers use concentrate to feed the pig • No de-worming or vaccination	• Lack of knowledge on disease management • High mortality rate • Availability of piglets, particularly

			after Christmas • Low growth rate of pig • Disease

Members' perspective on improving the livelihoods

Members preferences and choice		Reason	Members perspective on improving the livelihoods
Rank	**Livelihood Activity**		
1	Pig	Every household involved, profitable, no marketing problem, can look after easily being in home.	1. Training on improved practices to enhance production and disease management in paddy, ginger. oilseed 2. Training on vegetable cultivation, use of compost will help them to commercially produce vegetable 3. Farm mechanization – availability of tractor, efficient cleaning and earthing and other equipments, seed separator from maize 4. Irrigation facilities – pump set, water bodies etc. 5. Linkage with outside buyer for better price for all produces is a major need 6. Training on scientific way of pig raring. 7. Capital support to enhance size of the activity and business
1	Maize	Used for consumption, profitable, no marketing problem, short duration, less investment, feed for pig.	
2	Mustard	Most of the families are engaged, low risk, less labour intensive, short duration, no marketing problem, less investment.	
2	Black gram and buckwheat	Most of the families are engaged, low risk, labour intensive for cleaning, short duration, no marketing problem, less investment.	
3	Paddy	Almost all families have sufficient production for consumption. Increased production will help them to sell.	
3	Ginger	All families are involved but getting better price is a real problem, labour intensive.	
4	Vegetable	Low risk, everybody involved, profitable and family consumption	

Stakeholder consultation

Team interacted with the district and block level stakeholders like Agriculture, Horticulture, and Spice Board to share the primary observation made in the field, understand their perspective, development/department's priorities and scope of convergence.

Name of institution	Spice Board
Name and designation, contact no of the person	Mr. Jyothish, Sr. Field Officer- 9447598825
Current scenario in production/post production – challenges/success	Large cardamom is grown in the hilly area with gentle slope and farmers grow Ginger and Turmeric in plain area on upland. Productivity is less than the potential, no use of external inputs. Farmers are gradually shifting from Jhum to Settle agriculture through horticulture crops. **Large cardamom-** • Farmers started growing large cardamom 4-5 years back. • Though farmers are trained now they do not maintained specified standard like spacing (4.5 ft) and 4000 plants in per hactor. • Farmers are planting Sowney variety • Viral attack-Chirki & furki • Size and colour of capsules is not consistent which are important factors for getting better price. **Ginger** • Large quantity are produced • No varietal change, farmers using same rhizome years after years • Use local variety smaller rhizome • Productivity is good • Fungal attack-ginger soft rot • Farmers get very low rate of their produce and gradually no of farmers are decreasing. • Rhizome preservation technique used by farmers does not ensure quality.
New technology/varieties	• Cardamom- Sowney • Ginger-Nadia • Modified *Bhatti drier (wood) with flue pipe.* • *Sawo Drier-Mechanical drier (heater), approved by Spice Board.*
challenges in technology transfer	**Large cardamom** • Getting quality rhizome/seedling is a real challenge for the farmer for expansion. Seedling from Sikkim was affected by virus which has affected the production. • Fungal blast • Farmers are not trained and aware on maintaining

	colour-mostly dry on their chullah (smoke) and not interested to adopt better drying technology.
Programs, schemes	• Looking at the growth potential, Board started new plantation schemes and already 300 farmers have made expansion on 200 ha area. The Board provided Rs.28,000 per ha for planting materials and labour components. • The Board is trying to promote virus free seedling growing area, schemes on the same will be implemented next year. • Recommended practice is using modified *Bhatti drier (wood) with flue pipe.* There is a provision of getting 75% subsidy on the same. • Value addition for ginger – processing and drying
Key recommendations,	**Large Cardamom** • Awareness and Training on post-harvest management and index of quality (colour, size, flavour and moisture content) which determines the price. • The curing process followed by the farmers should be changed (using their challah). Recommended practice is using modified *Bhatti drier (wood) with flue pipe.* There is a provision of getting 75% subsidy on the same. • Farmers also may use Sawo drier –Mechanical drier (heater) which has also been approved by the Board. • Promote virus free seedling growing area in convergence with Spice Board • Encouraging farmers (Members of SHG) to aggregate their produce at the village level, help traders for collection and negotiating with the traders. • Village level aggregator/traders can directly access auction market **Ginger** • Shifting or delaying harvesting time will increase the fibre content. • Rhizome preservation – use of bio-agent Pseudomonas Trichoderma • Awareness on fibre variety and encouraging entrepreneur for ginger processing
Scope of convergence	• Training of farmers • Registration of farmers for new plantation schemes for area expansion

	• Setting up modified bhatti drier (wood) with flue pipe with 75% subsidy. • Linkage with proposed Auction centre in Namsai

Line departments (Agri/Horti)

Name of Dept.	**Agriculture**
Name and designation, contact no of the person	R.D.Singh , ADO- 9436053687, K.Padam Kumar Singh-H.D.O-Farm-9436836117
Current scenario in production/post production – challenges/success	Large area under production of oilseed and pulses, productivity is at par, no significant issues and challenges in production. Dept has brought 500 ha area under organic mission. Soil is deficient in N,P and K. Dept. Is distributing bio-fertilizers and bio-fungicides. Soil PH is favourable for production (5-6). Pump oil cultivation is new crop in the area. Rubber cultivation has also been started by few farmers. Current paddy productivity is 22-25 q/ha in WRC.
New technology/varieties	Dept. Promotes and encourage farmers to produce MTU -7029 which has production of 30-35 q/ha. IR-64 and IR-08 are the other varieties. Dept. Suggest use of Varuna M-27 mustard seed for better production. For Maize HQPM-HYV but farmers do not prefer HYV.
Major diseases and pest and controlling mechanism	No such major diseases and pest infestation, only leaf hopper, roller and Gundhibug.
Soil quality, deficiency of nutrient	No use of external inputs in paddy, oilseed, pulses and millets but those who grow vegetable in commercial way (Nepali and Assamees) use chemical fertilizers.
Ongoing program/schemes	RKVY, NFSM, mission organic, Pradhan Mantri Krishi Sinchayee Yojana Dept. Has engaged SIMFED (Sikkim State Co-operative for supply and marketing) for training, aggregation, marketing and input supply. Dept. Has promoted 24 FIG who get input for 1 ha land. Rs.3750 for off farm and Rs.3750 no farm assistance.
Major challenges in technology transfer	Farmers are not ready to change their variety, change in practices is difficult if it is labour intensive.
Key recommendations for ArSRLM	No such recommendation for production related intervention. ArSRLM should focus on aggregation and marketing arrangement.
Scope of convergence	Not mentioned

Recommendation and suggestion

Production Aspects

Livelihoods activity	Recommendation
Paddy	• Promotion of SRI/improved method of paddy cultivation (seed treatment, young seedling, line sowing, weeder

	application) with proper water management systems like drainage and bunding • Custom hiring centres having agri-equipments and machinery, power tiller, pump set etc. • Water harvesting for ensuring critical irrigation-conducting feasibility study for sustainable models. • Seed replacement, varietal change (as per agriculture dept. suggestion (MTU-7029, IR-08, IR-64.) for surplus production, not for food security, as local people do not prefer to eat other rice variety. • Application of green manuring for management of soil nutrient requirement though natural practice. • Use of organic inputs (converting biomass) • Use of bio-pesticides to control pest and insects
Ginger	• Training on seed conservation/storage and systemic orchard management • Popularize variety – Nadia • Rhizome preservation – use of bio-agent Pseudomonas Trichoderma • Sowing in furrow/mulching • Nutrient management – conversion of biomass into organic inputs • Encouraging local entrepreneur for ginger processing • Capital support
Oilseed/pulses/buckwheat/maize	• Ensuring critical irrigation will enhance the production. • Training on disease and pest management • Market related intervention is the utmost the need at this moment. • Farm mechanization – availability of tractor, efficient cleaning and earthing and other equipments, seed separator from maize
Vegetable	• Intensifying vegetable production in those villages where people are doing it with commercial outlook. • Training on vegetable cultivation, use of compost will help them to commercially produce vegetable • Training on nursery management • Use of organic inputs through conversion of biomass • Use of bio-pesticides to control pest and insects • Village level aggregation centre may be promoted • Capital support
Livestock-Pig	• Conducting mass Awareness and animal health camps + Regular de-worming and mineral supplementation • Encouraging farmers for breeding unit • Scientific raring in pig sty and maintenance of hygiene.
Water conservation and irrigation	• Entire area has good potential for developing rain water harvesting structure for agriculture purpose • The foothill zone is suitable for the development of ground water through structures like dug wells, hand

pumps and shallow tube well.

Market aspects

Name of the Markets where members sell their primary produces and their location, distance from Block head quarter

Type of market	No	Distance from Block H.Q	Villages that access this market
Roing –Daily market (Retail)	1	0	Very few villages which are very near to Roing and well connected.
Roing – weekly market (Retail)	1	0	Almost all villages, farmers come to weekly market to sell their produce.
Tinsukia –Wholesale	1	107 km	Traders from Assam collect the produce mainly vegetable, Ginger and sell at tinsukia wholesale market

Features of major markets

Features	Roing
Type	Primary
Periodicity	Daily
Size (Retail, Wholesale)	No of wholesaler- villagers directly come and sale to the retailer, retailer- around 15 (local women), 20 who have permanent shops (outsider). On Sunday weekly market more than 100 local growers sell their produce Business volume – permanent shopkeepers sell average Rs. 3000-4000 per day and local seller (women) sell Rs.800-1000 majorly leafy vegetables and other products
Major vegetable/other products supplied (quantify) A) targeted block – B) Other area (mention)	Weekly 5-6 vehicles comes from local area (tomato, cabbage, cauliflower, carrot, beans, brinjal (local),broccoli etc, weekly volume would be around 3-4 tons, capsicum, cucumber and chilli comes from outside, capsicum from Shillong, cucumber and chilli from Tinsukia From April onwards vegetable from outside mainly from Tinsukia, and adjacent area (assam), Bitter gourd, Pointed gourd, ladies finger, cucumber flows into the market but quantity is very less (2-3 pick-up). Local people does not consume outside vegetable much.

Peak Demand period	April-Sept when local vegetables are not available
Peak Supply period	Oct-Feb almost all varieties of winter vegetables are grown in the local area which is mostly grown by Assamees community who take land from local farmers on lease.
Supply Chain (forward)	Vegetable- Local growers sell to traders who has also retail shop in Roing who further supply to Tinsukia, outside trader are very less in number- mainly tomato, cabbage and cauliflour supplied to Tinsukia.
Supply to places	Local markets in Assam and Tinsukia for wholesale
Challenges faced by retailer, wholesaler	As local people prefer to consume their own produce, mainly leafy vegetable, demand of other vegetable are less, very small town consumption are very less. Local resident also prefer to buy vegetable on weekly market (Sunday) when local growers directly sell their produce in the market so demand on other days (weekdays) are very less.
Recommendation by wholesaler/retailer on product quality, procurement, transportation, handling etc.	The market size in Roing is very small. But in peak production period like Oct-January, scope is limited for consuming large quantity of vegetable. So its limits the scope for area expansion but is sizable production happens, it can be supplied to Assam, particularly Tinsukia but it would compete with production cluster in Assam.
Scope of intervention	Village level aggregation, encouraging local entrepreneurs/traders to access Tinsukia market

Local vegetable are common in the market

Vegetable market in Roing

Village level aggregator

There are 10-12 village level aggregator from Bihar who are settled in the village (Denllo). They collect the produces like Mustard, Ginger, Buckwheat, Pulses. Traders from Assam collect the produce from these aggregators. The following table gives information regarding aggregation done at village level.

Crop	Quantity	Procurement (Rs./kg)	Rate
Buckwheat	50 MT	50	
Mustard	40MT	25-26	
Maize	360MT	9-10	
Ginger	450 MT	13	

Price trend analysis of major markets (Roing and Tinsukia)

Produce	Roing (farmers level)	Roing (Retail)	Tinsukia (Wholesale)
Cabbage	12	20	12
Cauliflower	25	40	25
Tomato	20	40	22
Brinjal	20	30	15-20
Potato	12	15	NA
Chilli	45	60	50
Ginger	12	NA	20

Price realization across the chain (Roing market)

Commodity	Producer level	Primary aggregator	transporter	2nd level aggregator	Wholesaler	Commission agent	Retail price
Cabbage	12	15	2				20
Cauliflower	25	30					40
Tomato	20	25					40
Brinjal	20	25					30
Potato	12						15
Chilli	35	45					60
Mustard							
Buckwheat							

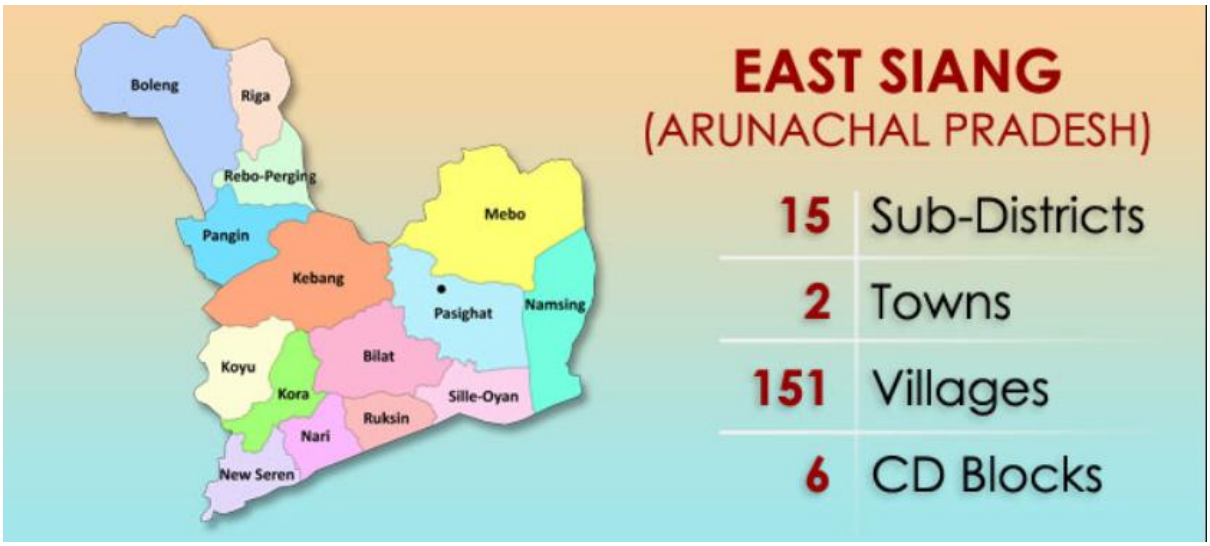
Local growers directly come to the market and sell to retailers so only transportation cost is added

Secondary data about the district and block

Before collecting the primary information from the field, the study team collected basic demographic, physiographic, agro-climatic condition, cropping pattern from secondary sources.

Demography

Siang District is the 21st district of Arunachal Pradesh State. Pangin is a Block under Siang district, is now the district headquarter. According to the administration records, the block has 36 villages and there are total 1811 families in this Block. The study team could not collect the newly formed district map, so Panging is shown in the following map of East Siang.



Note: *Before 2015, Panging was part of East Siang district. his district was created bifurcating West Siangand East Siang districts of Arunachal Pradesh consisting of 32-Rumgong-Kaying and 35-Boleng-Pangin Constituencies. The district was inaugurated on 27 November 2015.*

Siang district has 4 Sub-Divisions; Boleng Sub-Division: Circles of Boleng, Riga, Rebo-Perging; Pangin Sub-Division: Circles of Pangin, Kebang; Rumgong Sub-Division: Circles of Jomlo Mobuk, Rumgong; Kaying Sub-Division: Circles of Kaying, Payum

Population of Pangin Block

As per Census 2011, Pangin's population is 10200. Out of this, 5163 are males whereas the females count 5037 here. This block has 1456 children in the age bracket of 0-6 years. Among them 724 are boys and 732 are girls.

Total population	Total households	Male	female	0-6 years children	ST	Inhabited Village
Pangin CD block						
10200		5163	5037	1456		

Physiography

The Siang District is primarily mountainous in nature, where the hill with more than 450 meters above sea level. Located in the Eastern Himalayan mountainous terrain the district has high mountainous peak and irregular land forms. River Siang is the major drainage. The altitude of few locations

1. Ruksin : < 150 m above sea level
2. Pasighat: 150-300 m above sea level
3. Mebo: 300 – 450 m above sea level
4. Pangin: > 450 m above sea level : Represent plain and midhill to top hill

Soil

A Study was conducted on “Soil dynamic of agricultural landscape in East Siang District of Arunachal Pradesh” in Ruksin, Mebo, Pasighat and Pangin. The result of the study are given below

Study site	Depth (cm)	Bulk density (g cm^{-3})	Porosity (%)	Water holding capacity (WHC) (%)	% of soil particles			Texture class
					Sand	Clay	Silt	
Ruksin(<150 m asl)	0-15	0.78±0.01	70.57±0.22	68.50±0.67	72	4	24	Loamy sand
	15-30	0.80±0.00	69.56±0.13	70.08±0.95	68	4	28	Sandy Loam
Pasighat (150-300 m asl)	0-15	0.71±0.01	73.08±0.33	54.55±0.42	80	2	18	Loamy sand
	15-30	0.72±0.02	72.70±0.77	63.04±0.28	72	2	26	Loamy sand
Mebo (300 – 450 m asl)	0-15	0.68±0.01	74.21±0.33	82.94±0.61	52	8	40	Sandy loam
	15-30	0.76±0.01	71.32±0.44	83.56±0.04	40	8	52	Silt loam
Pangin (>450 m asl)	0-15	0.69±0.01	73.96±0.22	78.52±0.73	48	8	44	Silt loam
	15-30	0.72±0.01	72.83±0.44	76.50±0.53	72	4	24	Loamy sand

The result shows that the upper layer of soil 0-15 cm depth in Pangin are silt loam type and the second layer 15-30 cm is loamy sand. Study also revealed that in all the study sites, soil pH tends to be slightly more acidic in post-monsoon and winter than pre-monsoon and monsoon. Soil was more acidic in Ruksin and Pasighat than Mebo and Pangin . This might be because of burning of crop residues in the agricultural field which is more frequent in higher altitude sites that is, Mebo and Pangin. Burning increases the soil pH. The study made a conclusion with few points, soil fertility was better in Pasighat and Mebo than Ruksin and Pangin Pangin represent plain and midhill to top hill, respectively are exposed to severe climatic condition which hamper natural processes of soil fertility restoration and Pangin being in higher altitude, there are downward movements of mountainous organic mass

resulting to poor soil nutrient. It's suggested better management and increasing in cropping intensities with regular recuperative periods for enhancing and restoring soil fertility is need of the time.

Agro-climatic condition

The Northern part have mountain type climate. The agro-climatic Zone as per Planning Commission is Eastern Himalayan region and North Eastern Hill Region as

Rainfall	Normal RF (mm)	Normal Rainy days (number)	Normal Onset (specify week and month)	Normal Cessation (specify week and month)
Monsoon/SW monsoon (June-Sep)	2548.4	67	1st week June	Last week of September
Post monsoon/NE monsoon (Oct-Dec)	232.4	11	1st week October	Last week of October
Winter (Jan- February)	173.6	19	3rd week February	Last week of March
Pre monsoon/Summer (April-May)	779.2	31	1st week April	Last Week of May
Annual	3733.6	128	-	-

per NARP. Heavy rainfall is received during June to September. June, July and August are the hottest months and December and January are the coldest months. The district received wind during winter most of the rainfalls occur during June to September. The maximum temperature is around 34º C and minimum is 9.0º C.

Production of horticultural crops in Siang district (2016-17)

Crop	Area in Ha	Production in MT	Yield in MT
Banana	35	564	16
Pineapple	65.60	658.90	10
Kinnow/Mandarin Orange	2018	13444	7
Large Cardamom	719	250	0.34
Ginger	327	2314	7
Turmeric	119	880	7
Total	**3283**		

Source: Dept. of Agriculture, Siang district, Pangin

Primary data collection

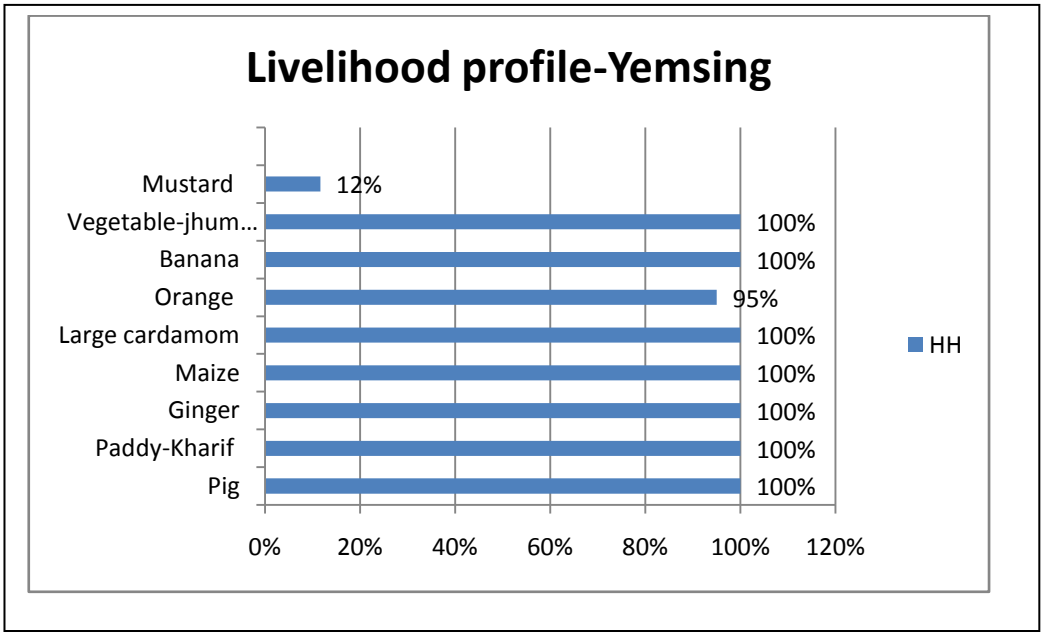
The study collected information of the block from the block staffs in terms of households, community, remoteness of villages, cropping pattern of different villages. Based on this the study team identified villages (sample) for conducting the primary level information on livelihood. The team analyzed the demographic information of the villages and identified villages which rrepresents the block in terms

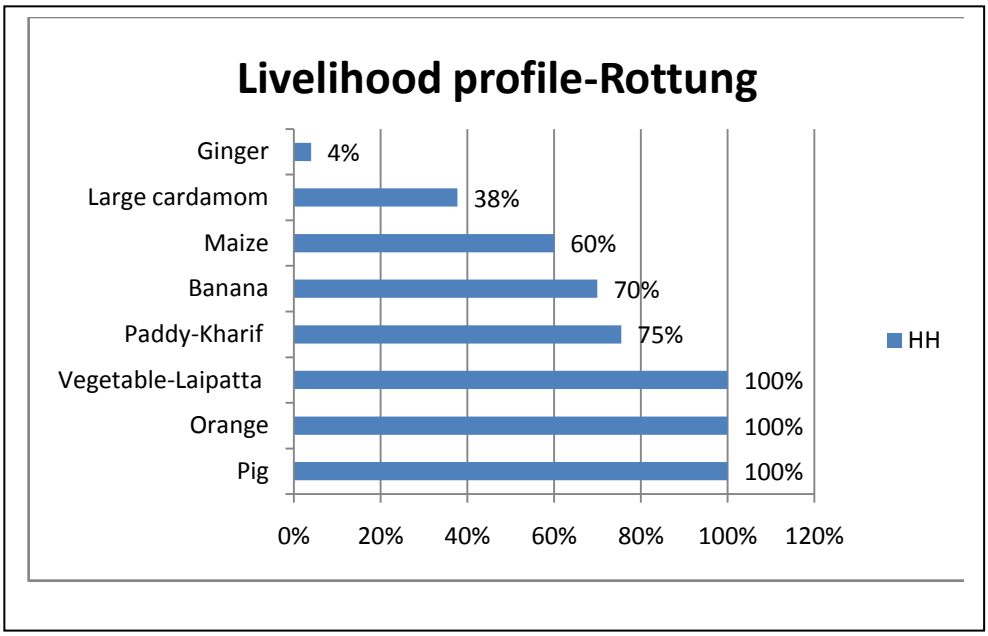
of diversity of livelihoods/cropping pattern/ terrain/community/ poverty/remoteness/ backwardness etc.

Village	Features	Remarks
Yemsing & Kebang, Sole	• Far from Block/district HQ and main road • Paddy, large cardamom and orange cultivation area • Communication	**Sample Village-1 &2**
Pangin (Rural)	• Adjacent to Pangin Block/district HQ • Large area under Orange and paddy • Close proximity to market and national highway	**Sample village-3**
Routtung	• Closure to Pasighat and beside the national highway • Less intensive agriculture • Food security is a concern, few landless households are there in the village	**Sample Village-4**

Livelihood profile

ArSRLM has promoted SHGs covering good number of households in the villages at Pangin block. The major livelihoods are agri-Horti based. The livelihoods profile of three sample villages is given below. (% of HH in each livelihood)





Resources

Type of Land and its use

The hills have mainly three type of slopes; steep slopes (most of the area), Moderate slope and gently slope. People used to grow maize, rice and vegetable (Jhum cultivation) in moderate sloping hills with deep fine soils. Farmers also grow ginger, orange and large cardamom in the moderate area. WRC paddy is cultivated on gentle sloppy land and valley land.

Orange cultivated on moderate sloppy land at Yemsing village

Paddy land on gentle sloppy land at Kebang Solay village

Water

The average annual rain fall in Pangin Block is very high. Pangin gets the pre-monsoon rain in April and rainy season last still the month of September. The ground water recharge is replenished annually by amount of precipitation throughout the year. The ground water emerges out in the form of springs along the fracture at lower points the movement and these springs are the major sources of water for drinking, household use and agriculture. Storage of ground water is almost nil. As

per the Central Ground water Board's document, most of the area is occupied by structural hills. The rocks are very hard and compact with steep slopes. The only scope for the ground water development in this area through the improvement of the springs. These springs can be developed for drinking and local irrigation purpose.

Agriculture-horticulture scenario

Pangin block is mainly known for horticultural produce. It is production hub of Orange, banana and Pears. The agriculture practices and cropping pattern in all villages are very similar. Paddy and maize are grown by almost all families. Large cardamom, ginger, turmeric is major spices orange, pears, banana and pineapple are the major horticultural crops. Farmers do not use any external inputs for nutrient and pest management. Jhum cultivation is widely practice in the area. Transportation is a major challenge and agriculture and horticulture produce could not fetch fare price for this reason. There are some villages which are remote from the block HQ, traders even could not reach and farmers could not harvest Ginger for two years.

Paddy: In April-May people prepare nursery and do TRC/WRC paddy in June-July on valley type land and gentle sloppy land. Mostly local varieties are grown. Transplantation time depends on the variety. Riga and Itanagar is sown in May and Moro, Tasun variety is sown in June. Farmer still manually separate paddy seed from straw (jumping on paddy straw), so farm mechanization is a major need.

Maize: Farmers sow maize in two different seasons. In Kharif maize is sown during March-April and Rabi season in Sept.

Vegetable: Most of the families grow leafy vegetable, chilli, pumkin, squash, cucumber and coriander as intercrop with large cardamom during 1st year of plantation. They also grow vegetable in jhum cultivation. Almost every family grows vegetable for their own consumption. Most of the time vegetable grown on field is destroyed by Mithun.

Ginger: Farmers grow ginger in the moderately steep sloping hills with deep fine soils. They follow shifting cultivation method in ginger as they do not grow ginger in the same field next year. The area under ginger cultivation is getting reduced day by day. It is mainly due to marketing problem. The production risk (ginger rot) is also increasing. There are some villages which are remote from the block HQ, traders even could not reach and farmers could not harvest Ginger for two years.

Vegetable cultivation

Cauliflower eaten by Mithun

Large cardamom: During last four-five years large cardamom has been popularized in the block. Farmers are mostly converted their existing field and also creating new area for expansion.

Jhum cultivation: Most of the people in this village practice jhum cultivation. The preparation of jhum cultivation is start from February, March harvesting time September, October. According to the people very hard labour and not much profit compared to hard work and if the weather condition is not in favour. Preparing jhum include cutting down the tree, burning the trees, cleaning. The crops cultivated in jhum are namely, rice, chilli, pumpkin, cucumber, maize, green leaf vegetable, ginger, turmeric. Etc.

- Use broadcasting method
- No external inputs
- Use traditional seed (own seed)
- Some farmers use log bunding method across the slope to conserve soil and nutrient.

Orange: Pangin block is the production hub for Oranges in the state. Almost ball families are engaged in orange cultivation. Few families have large no of plants and managing the orchard is an issue for them. No external inputs are used in orchard management. So it's organically grown. Orange is grown in moderately to steep slope. December-January is the pick harvesting period.

Agriculture seasonal calendar

Crop	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Remarks
Maize	LP H(mature)	LP	S	W		H (Small)	LP	H (mature) S	W	W	W	H (small)	
Paddy				N	N	T	T	W		H	H		
Ginger		LP	S		W		W		W			H	
Orange	H	H										H	
vegetable					S	S		H	H				
Large cardamom	C H	C	LP	P			W		W		H	H	Major Harvesting starts in 3rd year

*LP= Land preparation, S= Sowing, N= Nursery, P, Plantation, T= Transplantation, E= Earthing up, W= Weeding, H= Harvesting,

Production practices, productivity, issues, challenges

Crop	Production practices	Challenges shared by SHG members
Paddy	**Production practice** • Farmers grow paddy on gentle sloppy land and valley land and practice WRC(Wet rice cultivation) • Rainfed paddy • All the family follow traditional practices, most of the family transplant single/two seedling. • Age of seedling varies among farmers 35-40 days • Seed rate varies • Seed replacement almost nil, farmers use local variety • Seed treatment not in practice • Farmers do not use any external inputs. • Only one time weeding is done. **Productivity** As farmers are not aware of the measurement of their land it is difficult to measure the productivity of paddy. However study team measured land of one SHG members who had best production in last kharif season and estimated the production which is 3500 kg per Ha. But the average production is less. This is lower than the productivity can be achieved in line transplantation or SRI (4000-5000 KG/Ha)	• Water crisis during transplantation- On time sowing/transplantation is a major challenge as it is rainfed agriculture. • Landslide causes less production or sometime complete damage • Disease and pest – Leaf hopper/roller and gundhi bag, fungal attack
Orange	• Almost all families have orange plantation but no of plants varies from 50 to 10000. • Orchard management is the major issue, after plantation no proper care is taken by most of the farmer. • Pruning is not done by all farmers • No external inputs are applied • Spacing not maintained properly 5 ft x 5ft (in the orchard visited by the team)while recommendation is 6 ft x 6ft • January and February is the peak	• Plants are died and production is reducing day by day. • Availability of quality sapling is an issue. • Disease and pest attack (trunk borer) • Fruit dropping • Farmers do not get proper price

	harvesting period. Farmers do not follow proper harvesting which result in fruit damage.	
Ginger	• Ginger is grown on gentle sloppy land. • Farmers are using same rhizome years after years and no varietal change • Ginger exhaust nutrients from the soil, even no external inputs are added on land • Seed rate varies among farmers (depends on the land position and soil type) **Productivity** Production related data are available but as land measurement is a real difficult proposition, study team explored the conversion rate like how much rhizome was used how much produce harvested. It was noted that the conversion ratio was 1: 5 or 6. This ratio is at lower side as this may be increased upto 1: 8	• Low productivity • Fungal attack-ginger soft rot • Heavy rainfall damages the production • Farmers get very low rate of their produce and gradually no of farmers are decreasing. Farmers in remote village do not harvest labour cost will be higher than the sales value.
Vegetable	• Vegetable is mostly grown for the purpose of own consumption • Almost all households grow leafy vegetable like lia patta, chilli, king chilli and pumpkin • No external inputs are used • Production is high during Aug-Sept.	• Non availability of quality seeds • Damage of seedling in nursery • Disease and pest • Damage by Mithun, high investment requires for fencing.
Livestock-Pig	• Almost all households rare pig • Open grazing is the most common practice • No de-worming or vaccination	• Availability of piglets, particularly after Christmas • Low growth • Disease

Members' perspective on improving the livelihoods

Members preferences and choice		Reason	Members perspective on improving the livelihoods
Rank	**Livelihood Activity**		
1	Large cardamom	Almost every family is engaged and already	8. Linkage with outside buyer for better price in large

		invested a lot, high profit	cardamom, orange and ginger
2	Paddy	Food security, Rottung village, most of the farmers have only 6 months food security	9. Information on market rate of orange, large cardamom and ginger at the village level.
3	Orange	Almost every family is engaged and already invested a lot but rate fluctuates, do not have any control, medium profit	10. Training on improved practices to enhance production and disease management in Cardamom, paddy and orange
4	Pig	Low risk, everybody involved, profitable and family consumption, medium profit	11. Drainage, channel to divert water from paddy field during heavy rain in valley land.
5	Ginger (In rotting (Rank-3)	Low market rate but farmers have been doing it for long.	12. Farm mechanization – thresher 13. Capital support to enhance size of the activity, area expansion for large cardamom and setting up drying unit.

Perspective, development/department's priorities and scope of convergence.

Line departments (Horticulture)

Name of Dept.	**Horticulture**
Name and designation, contact no of the person	Mr. Oyin Tayeng, Horticulture Development Officer, 9612210217 Mr. S.K.Rana- Fieldman, 9436895302
Current scenario in production/post production – challenges/success	The productivity of horticultural crops is decreasing day by day, after 10-12 years nutrition exhausted, farmers do not take any measures on soil fertility management. The PH of the soil is 5.8-5.9, soil is deficient in micro-nutrient and P (Macro-nutrient) **Orange** • Farmers do not put efforts for orchard management like, maintaining proper space (6 ft x 6ft) square planting, pruning in 2nd year onwards, application of lime etc. • There is no private nursery in Pangin, Saplings from Assam, quality is not good.

	• Quality of the produce is not so good-no smooth skin • Heavy infestation and pest attack –trunk borer and fungal disease. Leaf minor, Powdery mildew, citrus cyla etc. • Farmers are less aware about the harvesting and post harvest (transportation) techniques to minimize the fruit injury. • Transportation problem, major challenge for farmer to get better price. • One processing unit established but not functional – labour and technician problem
New technology/varieties	No significant changes in adoption of technology in recent years
Area, production, productivity data of major produces	Crop / Area (ha) / Production MT / Productivity MT/Ha Kinnow/Mandarin Orange: 2018 / 13444 / 7 Large Cardamom: 719 / 250 / 0.34 Ginger: 327 / 2314 / 7 Turmeric: 119 / 880 / 7
Major diseases and pest and controlling mechanism	Heavy infestation and pest attack –trunk borer and fungal disease. Leaf minor, Powdery mildew, citrus cyla etc. Farmers do not use any insecticides or pesticides. Few farmers apply lime as per dept. suggestion.
Soil quality, deficiency of nutrient	The PH of the soil is 5.8-5.9, soil is deficient in micro-nutrient and P (Macro-nutrient)
Ongoing program/schemes	National Horticulture Mission
Major challenges in technology transfer	Farmers do not put efforts for orchard management like, maintaining proper space (6 ft x 6ft) square planting, pruning in 2nd year onwards, application of lime etc. There is no private nursery in Pangin, Saplings from Assam, quality is not good.
Key recommendations	Encourage farmers for proper orchard management, Dept. will give training on orchard management, disease and pest management. Farmers should apply nutrient to very old orchard and regularly do pruning. Application of lime with copper sulphate (bodex mixture) to control algae. This will also be effective against termite, snail and trunk borer. Awareness and enhancing skill of farmers on proper harvesting (twist) instead of plucking (there would be hole on the tip) of farmer and layering during transportation.
Scope of	Training of farmers, New area expansion, post harvest

convergence	management –aggregation through promotion of FIG.

Agriculture Department

Name of Dept.	**Agriculture**
Name and designation, contact no of the person	Pating Tamuk – AFA, 9436838855
Current scenario in production/post production – challenges/success	Seed replacement ratio is very poor, farmers prefer to use their local seed. Transplantation on time is a problem due to uncertainty of rain No use of external inputs, only crop residue is the source of N,P.K so soil is Nutrient deficient Insect and pest infestation – leaf hopper, roller Land slide also is a major challenge for farmers. Paddy variety grown in the area, Deku (120-130 days), Pangkang (120-130 days), Tachung (150-160 days), Lemuk (120-140 days) and Itanagar (120-130 days)
New technology/varieties	Department tried to introduce high yielding rice varieties but very low response from farmers as they prefer (food habit) to grow local variety
Area, production, productivity data of major produces	Not available
Major diseases and pest and controlling mechanism	No such major diseases and pest infestation, only leaf hopper, roller and Gundhibug. There is no controlling measures taken by farmers
Soil quality, deficiency of nutrient	No use of external inputs, only crop residue is the source of N,P.K so soil is Nutrient deficient
Ongoing program/schemes	RKVY, NFSM, mission organic
Major challenges in technology transfer	Farmers are not ready to change their variety, change in practices is difficult if it is labour intensive. Farm mechanization is problem because of terrain and scattered land
Key recommendations for ArSRLM	No such recommendation
Scope of convergence	Training of farmers, farm mechanization- paddy thresher

Recommendation and suggestion

Production Aspects

Livelihoods activity	Recommendation
Paddy	• Productivity enhancement would be a major intervention point as food security is an issue in many villages.

	• Promotion of SRI/improved method of paddy cultivation (seed treatment, young seedling, line sowing, weeder application) with proper water management systems like drainage and bunding • Seed replacement • Drainage, channel to divert water from paddy field during heavy rain in valley land. • Farm mechanization – Power tiller and Thresher • Application of green manuring for management of soil nutrient requirement though natural practice. • Use of organic inputs (converting biomass) • Use of bio-pesticides to control pest and insects • Promotion of pulses and oilseeds after paddy harvesting
Ginger	Major emphasis would be given on aggregation and marketing but few initiatives can be taken in production side like • Training on seed conservation/storage and systemic orchard management • Changing cropping sequence – Ginger-legumes-veg+legumes-Ginger • Mulching with locally available weed biomass
Large cardamom	• Capital support to enhance size of the activity, area expansion for large cardamom and setting up drying unit. • Training of farmers on plantation techniques and Systemic orchard management • Awareness on soil PH- and application of lime • Application of external inputs- decomposed biomass • Stripping pulses, intercropping with pulses in 1st and 2nd year of production (when vegetative growth is less) • Terracing – log bunding • Maintaining shed on field through plantation • Terrace planting for better nutrient and water management
Orange	In orange efforts should be made on both production and market side. • Encourage farmers for proper orchard management; arrange training on orchard management, disease and pest management. • Farmers should apply nutrient to very old orchard and regularly do pruning. • Encouraging farmers to set up nursery as availability of quality sapling is an issue. • Application of lime with copper sulphate (bodex mixture) to control algae. This will also be effective against termite, snail and trunk borer. • Awareness and enhancing skill of farmers on proper harvesting (twist) instead of plucking (there would be hole on the tip) of farmer and layering during transportation.
Livestock-Pig	• Conducting mass Awareness and animal health camps +

	Regular de-worming and mineral supplementation • Encouraging farmers for breeding unit • Scientific raring in pig sty and maintenance of hygiene. • Encouraging few farmers for breeding unit

Market aspect

Markets study

Team visited local market, transit market at Pasighat, to understand the flow of the commodities (mainly vegetable and ginger), quantum of supply, traders and price variation, market systems etc. Team had Interaction with traders/wholesalers/retailer to understand demand and supply analysis, market size, price variation/trend, actors and their functions, Identifying scope on intervention.

Market Name	Distance from Block H.Q	Villages that access this market
Pasighat	35 km	Farmers from villages do not have access to any market. There are few aggregators from local area who collect mainly orange from village and supply to Pasighat market. Most of the time traders from Pasighat collect the produce mainly orange and Ginger from village and sell in Pasighat. ***Pasighat is the main transit market for Orange.***

Features of the market

Features	Vegetable	Orange
Type of market	Retail and wholesale	Transit market (wholesale)
Periodicity	Daily	Seasonal (Dec-Feb)
Size (Retail, Wholesale)	Most of the retailers are women except few retailers who are from Assam do vegetable retailing in the market. Most of the retailers (around 70) sell local vegetable and other retailers (outsider) sell other vegetables.	4-5 traders come from Guwahati who collect the produce from local aggregator (in few cases a group of women). Village level traders/traders from Pasighat procure orange from village and bring it to collection centres. There are 3 such main collection points in Pasighat. Entire production from Siang, East

		Siang and West Siang transit through Pasighat.
Major vegetable/other products supplied (quantify) C) targeted block – D) Other area (mention)	Local vegetable, chilli, brinjal, laipatta, Mustard leaves, ginger, King chilli and leafy vegetable collected from forest comes from serum, Namsing, Ngopok, Kiyit. Women farmers directly come with their produce and sale in the vegetable market. There were around 70 such retailers on the day of visit. Each retailer sales is around Rs.1000 per day. In season like Aug-Nov 10-12 vehicles (TATA Mobile) reach to the market. In other season, vegetable supply from local area is very less only 1-2 vehicle (TATA Mobile). There are two major vegetable producing clusters which are in plain land; reserve forest area and Jampani cluster. Tomato, chilli, cabbage, cauliflower, beans are the major produce in winter. 10-15 pickup vehicles from Jampani with 500-600 kg of vegetables reach to the market. There is no supply of vegetable from Pangin area.	In December and January the production and supply is maximum to pasighat market. On an average 15-20 TATA MOBILE with orange supplied to Pasighat. Average supply per day would be around 200000 – 300000 pieces. 3-4 LP truck loaded from Pasighat for Guwahati. There is no organised market for orange in Pasighat.
Peak Demand period	March-June when local vegetables are less available	Dec-Feb
Peak Supply period	Aug-Feb almost all varieties of winter vegetables are grown in the local area.	Dec-Feb
Supply Chain (forward)	Vegetable- Local growers come from serum, Namsing, Ngopok, Kiyit. Women farmers directly come with their produce and sale in the vegetable market. Village level traders also aggregate vegetable from farmers who produce commercially and sale it to the market. In Reserve and Jampani cluster traders from Pasighat collect vegetable from farmers and sale it to the wholesaler in the market.	Local growers sell to traders. No shorting/grading is done at producers level. Sometime traders give advance to the farmers and make contract for entire produce. Village level traders or outside traders collect the produce at village level and take it to pasighat by bolero pickup van/TAT Moblie van. 15000-16000 fruits is the capacity of the vehicle. At Pasighat 7-8 collection points are there where shorting/grading is done. Traders come from Guwahati who collect the produce from local aggregator

		(in few cases a group of women). Entire production from Siang, East Siang and West Siang transit through Pasighat.
Supply to places	This market does not supply vegetable to outside.	No supply. Vegetable inflow from Assam. This market does not supply any vegetable to outside.
Challenges faced by retailer, wholesaler	People prefer to consume local produce, mainly leafy vegetable, the supply is less in compare to demand. Vegetable sale is low, sometime vegetable supplied in a day takes 2-3 days to sale. Margin is very less.	Quality of the produce is not consistent; most of the fruits have injury either due to improper harvesting or during transportation. Farmers are less aware about the right stage for harvesting so that it gets less injury during transportation. When the season is almost over, i.e. last harvest, transportation is a big problem because fruits become softer.
Recommendation by wholesaler/retailer on product quality, procurement, transportation, handling etc.	Increase in production will ensure regular inflow of local vegetable into the market as traders will procure produce from village on regular basis and transportation cost can also be minimised if the volume increases.	Training of farmers on techniques and time for plucking the fruit. Precaution should be taken by the traders/farmers while loading their products while taking their produce to Pasighat, as the road condition is very poor.

Scope of intervention

- There is less scope on intervention in vegetable on market side as critical volume for aggregation at the village level is very low. So unless the production increases, less scope for market side intervention.
- Information to farmers on market rate of different produce- orange, ginger and large cardamom.

- Encouraging farmers (Members of SHG) to aggregate their produce at the village level, help traders for collection and negotiating with the traders
- Training of farmers on techniques and time for plucking the fruit. Precaution should be taken by the traders/farmers while loading their produce by using cushioning materials like straw, and layering of orange while loading.
- Farmers can also harvest the premium quality of fruits along with leaves as it will fetch better price in the market *(wholesaler in Guwahati shared the instance where some horticulture farm supplied this kind of product this year which fetched Rs. 15000 for 2400 pieces (standard way of counting and rate) when the normal rate of big size fruit were Rs. 12000 for 2400 pieces.*)

Orange unloaded at Pasighat for shorting/grading

Orange loaded on LP for Guwahati after grading

Villagers selling orange at Sesian

Vegetable from Reserve and Jampani for wholesale at Pasighat vegetable market

Local growers retail vegetables at Pasighat vegetable market

Guwahati Market

Orange market

The wholesale of orange is done in Fancy bazaar in Guwahati. Oranges from Pasighat and Silapathar finally reaches to Guwahati market. December and January is the peak supply period. On an average 8-9 LP truck with capacity of 60000 – 70000 pieces depending on the size are supplied to Guwahati market. In February supply gets reduced to 2-3 LP truck and finally in February last and March supply reduces to 1-2 LP truck. The rate of orange differs as per the size of the fruit. In February the price of different size of the fruits are given below.

Price realization per piece across the chain or orange (9th February, 2018)

Size of fruit	Producer level	Collection centre at Pasighat	Guwahati wholesale	retailer	Commission agent at Guwahati
Large	2.5 -2.6 (250-260 for 100 pieces) for small pieces)	3	5 (1200 for 2400 pieces)	. 8.75 (Rs. 700 for 8 pieces)	8%
Medium		2.5	3.75 (9000 for 2400 pieces		
Small		2	2.5 (6000 per 2400 pieces	Rs.5 per pieces	

Major quantity are supplied to Rangia, Nalbari and Barpeta from Guwahati and rest is sold in Guwahati retail markets. The peak demand in Guwahati is in the month of January before Bihu when the price increases upto Rs.15000 for 2400 pieces.

Orange getting unloaded at Fancy Market, Guwahati

Ginger Market

In Guwahati a new wholesale market has been established recently on Garchuk, Parmohi road. Vegetable and spices, mainly ginger comes from different production clusters in Assam. Study team explored the market rate and supply chain of ginger. Ginger are mainly supplied from BOKO near Assam-Meghalaya border. Ginger in BOKO market comes from Meghalay. According to the Wholesaler Ginger from Arunachal are small in size and colour is not proffered by the customer, so very less

quantity are procured from Arunachal.

Price of ginger (8th February, 2018)

Farmers price	Price at Boko	Wholesale price at Guwahati	Retail price
Rs.20/Kg	Rs. 32/Kg	Rs.40/Kg	Rs.80/Kg

Secondary data about the district and block

Before collecting the primary information from the field, the study team collected basic demographic, physiographic, agro-climatic condition, cropping pattern from secondary sources.

Demography

The Lower Subarnsiri district has two Sub-Divisions namely, Ziro and Raga; three blocks viz., Ziro-I, Ziro-II and Raga, and a total of six administrative circles namely, Ziro (Sadar), Yachuli, Pistana, Raga, Kamporijo and Dolumukh.

Ziro-II block has 3 circles, Yachuli, Pistana and Yazali. As per the administration records, block has 184 villages and there are total 4667 households in this Block. The following table represents the demographic details of the Ziro-II block &Yachuli circle. The total population of the block is 25399 with a population density of 17. Majority of the villages are small in size.

Total population	Total households	Male	female	0-6 years children	ST	Village
Block						
25399	4667	12857	12542	3877	88%	184

Physiography

Physiographic Divisions the Lower Subansiri District is primarily mountainous in nature, where the hill ranges varies approximately from 1000 to 1600 meters above sea level. Located in the Eastern Himalayan mountainous terrain the district can be broadly divided into two physiographic unit i. e. lower foothill and mountains. The topography changes from lower hills in the south to lofty mountains extending to northward in a succession of rolling hills to steep ridges at the centre and north.

About 97.38 per cent of total geographical area constitute greater and lesser Himalayan zone. Of this about 80.61 per cent area with hill side slopes and 12.57 per cent with moderately steep hills with narrow valley type landforms. A mere 2.62 per cent of total geographical territory of the district comprises summits, ridges and dune-type valleys under the Siwalik zone. Thus it is evidently clear that people living in such difficult hilly areas confront with various challenges in sustaining their lives. *(Source: Arunachal Pradesh Remote Sensing Application Centre, 2005.)*

Soil

The soil taxonomy of Ziro-II block has been identified into four major classes of fine; fine loamy, Loamy–skeletal and sandy-skeletal that represent a unique diversity across the block. The texture of the soil plays very crucial role in selection of crops, production and productivity. Two major soil types are primarily observed in the block viz. medium texture covering around 60 per cent of geographical area and fine soils over rest of 40 per cent of area. High and well distributed rain fall with thick vegetative cover have result of deep weathering of rock and given rise to very deep soils even on the hills slope. Soils are acidic in nature with high carbon content.

Forest

Traditionally large tribal population live in close association with forests thereby making it the most integral part of livelihood support system. Hollock (*Terminalia*), Jutli (*Altingia Excetsa*), Bahra (*Terninalia Belericia*), Amari (*Ammora Walliechie*), Sam (*Artocarpus Chaplasa*), Chapa (*Michelia* and *Mangolia* species) and Blue Pine (*Pinus Wallichaina*) are the prominent species found in abundance in the block.

Besides individual access to forest, each community has their own community forests exclusively managed by them for generations. The people of the area have been given special privileges to collect timbers and other minor forest produces on free of royalty for exclusive use. People also enjoy privileges of hunting and fishing Forest plays a very significant role in the livelihood pattern. Forest products are used for building houses, grain houses, fencing, fuel, supplementary food and for making crafts(primarily cane and bamboo).

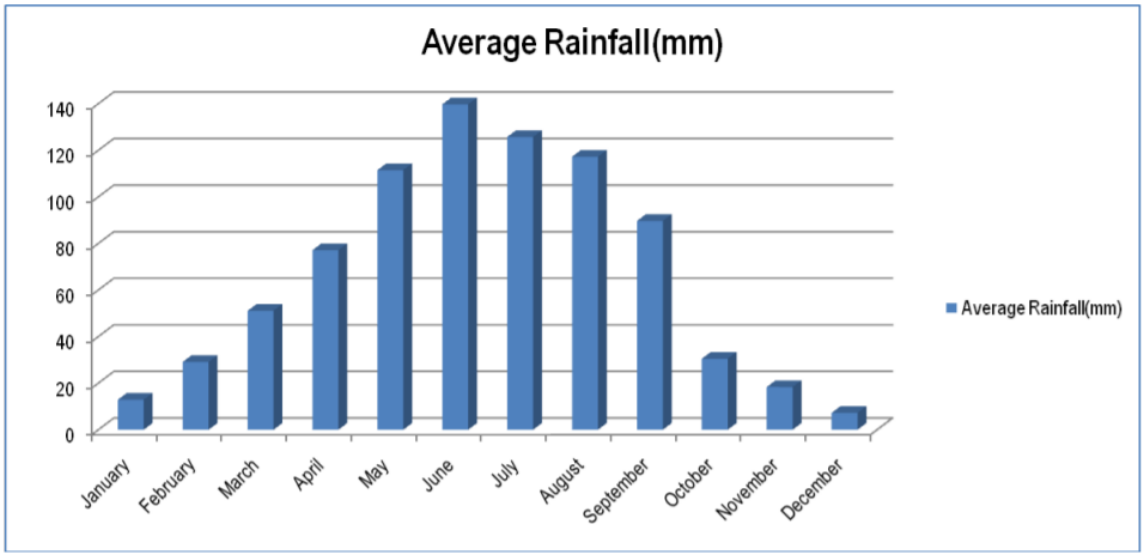
Agro climatic condition

Based on mapping of agro-climatic conditions by Arunachal Pradesh Remote Sensing Application Centre (2008) three broad zones are evidently found viz. tropical zone up to an altitude of 900 meters above mean sea level, sub-tropical zone lying between 901-1800 meters altitude and temperate zone between 1801-3500 meters altitude. Ziro-II block has all 3 types of zone, but majority of the area 791 sq km (65%) are under sub tropical zone. The agro-climatic Zone as per Planning Commission is North Eastern Hill Region and Temperate Sub Alpine (AZ49)Tropical Hill (AZ50) as per NARP.

Rain fall

Rainfall	Normal RF(mm)	Normal Rainy days (number)	Normal Onset (specify week and month)	Normal Cessation (specify week and month)
Monsoon (South west)June- Sept.	2268.2	40.18	1st June	8th October
Post monsoon (Oct – Dec)	225.4	7.15	2nd October	7th December
Winter (Jan - Feb)	89.5	-	-	-
Pre-monsoon/ Summer (March – May)	687	18.45	-	-
Annual	794.5	65.78	-	-

Source : :District Agriculture office Ziro, Lower Subansiri



Land use pattern of Lower Subarnsiri district

The lower subarnsiri district covers approximately an area of 3508 sq km. The topography of the district is mostly mountainous terrain, where the hill ranges vary approximately 1000 to 1600 meters above Mean Sea Level.

Land use under agriculture

Blocks	Number of village	Total geographical area (ha)	Gross cropped area(ha)	Net sown area (ha)	Area sown more than once (ha)	Cropping intensity (%)
Ziro-I	221	47957	3824.00	2909.72	914.28	131
Ziro-II	180	129901	5954.40	4030.77	1923.63	148
Tamen Raga	137	172941	434.10	340.31	93.79	128

Area under Irrigation

Blocks	Kharif			Rabi			Horticulture crops			Grand total
	Irrigated	Rainfed	Total	Irrigated	Rainfed	Total	Irrigated	Rainfed	Total	
Ziro-I	150	3339	3489.0	0	30	30	0	305	305	3824
Ziro-II	115	5659.4	5774.4	0	20	20	0	160	160	5954.4
Tamen Raga	105	219.10	324.1	0	10	10	0	100	100	434.1
Total	370	9217.5	9587.5	0	60	60	0	565	565	10212.5

Primary data collection

The study collected information of the block from the block staffs in terms of households, community, remoteness of villages, cropping pattern of different villages. Based on this the study team identified villages (sample) for conducting the primary level information on livelihood. The team analyzed the demographic information of the villages and identified villages which represent the block in terms of diversity of livelihoods/ cropping pattern/terrain/community/poverty/ remoteness/ backwardness etc.

Village	Features	Remarks
Jath	• Near to Block head quarter • Most of the family engaged in Large cardamom, Paddy, vegetable • Livelihoods pattern-representative of blocks	**Sample Village-1**
Lumri	• More intensive vegetable production • Pulses and oilseed • Large area under ginger	**Sample village-2**
Eribo	• Very far from block head quarter • Poor infrastructure (Road, water, electricity) • Jhum cultivation • Less access to facilities/markets etc.Forest village	**Sample Village-3**

Day-1, 2 & 3 (04th, 5th and 6th Dec, 2017)

The study visited the selected villages where ArSRLM has been working and interacted with SHG members to understand the livelihood scenario at the village level and also explore the intensity of engagement of SHG members in those activities. Before the FGD with SHG members, the team did a transact walk to understand the resources in the village. After the FGD, team interacted with individual SHG members on few activities (identified in the FGD) to understand the practices, challenges, scope and aspiration of the family. The study team also visited agriculture field to understand the land type, terrain, cropping pattern in different type of land, source of water etc.

On 2nd day the team interacted with KVK scientist and subject matter specialist in the block and interacted with about 50 farmers from different villages when they were assembled for observing World Soil Health day.

On 3rd day team interacted with large cardamom producers and local aggregators to understand the production and post production processes, selling price trend, issues in selling their produces etc.

Day-4 (7th Dec, 2017)

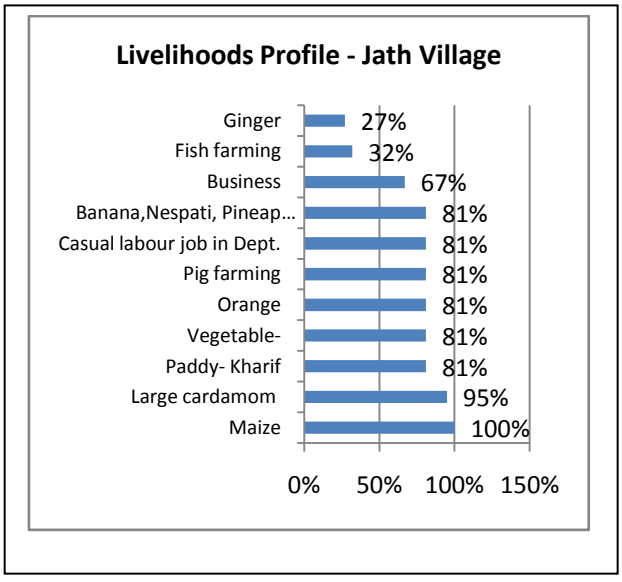
On day-4 team interacted with the district level stakeholders like Agriculture, Horticulture, Animal Husbandry departments at Ziro to share the primary observation made in the field, understand their perspective, development/department's priorities and scope of convergence.

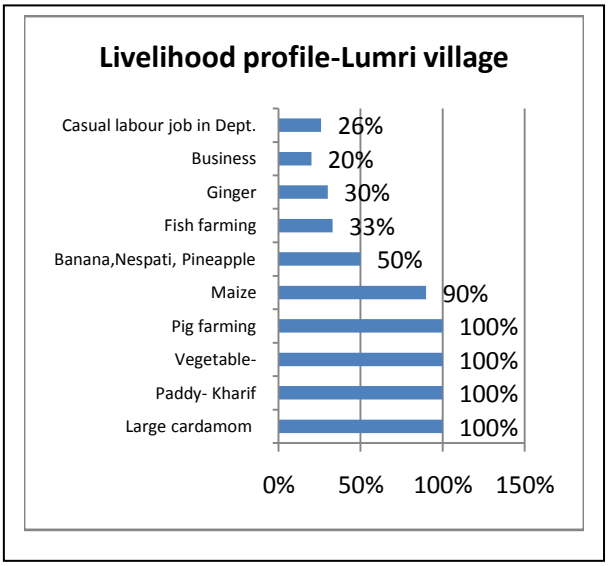
Day-5 & 6 (8th& 9th December, 2017)

Team visited markets in Itanagar, Naharlagun, Harmoti and Holongi to understand the flow of the commodities (mainly vegetable and Large cardamom), quantum of supply, traders and price variation, market systems etc. Team also identified few large cardamom trader and had interaction with them to understand the supply chain.

Livelihood profile

ArSRLM has promoted SHGs with good number of households in the villages at Yachuli block. The major livelihoods are agri-Horti based. The livelihoods profile of three sample villages is given below. (% of HH in each livelihood)





Resources

Type of Land and its use

The hills have mainly three type of slopes; steep slopes (most of the area), Moderate slope and gently slope. People used to grow maize, rice and vegetable (Jhum cultivation) in moderately steep sloping hills with deep fine soils. Farmers also grow ginger and large cardamom in the moderate slope area.

Large cardamom cultivated on gentle sloppy land and paddy on valley land

Paddy land on gentle sloppy land

In gentle slope or rather in valley farmers grow Paddy in WRC method. At the upper part of the valley farmers grow vegetable mainly during winter season.

Farmers grow horticulture plantation crops like orange, pears, on steep sloping hills with shallow sandy loamy soils at the base and plantation of trees on the upper side.

Water

The average annual rain fall in Ziro (HQ) is about 1910mm. The rainy season starts in the month of April and last still the month of September. The ground water recharge is replenished annually by amount of precipitation throughout the year. The ground water emerges out in the form of springs along the fracture at lower points

Paddy on valley land, Orange on steep slope at the lower side and trees on upper side of the hills

the movement and these springs are the major sources of water for drinking, household use and agriculture. Storage of ground water is restricted by limited areas, with the result, the springs dry up during the lean period however perennial spring flow throughout the year but their yield s decrease during dry season(March - April). There are few ponds (20-30 % of families) in each village at the foothills (lowest part of the valley) which are mostly used for fish farming. The surrounding hilly terrain recharges these valleys and ponds by their runoff. The ponds are very shallow and dry during March-April. Desilting of these water bodies and removal of debris may increase water conservation.

Agriculture scenario

The agriculture practices and cropping pattern in all villages are very similar. Paddy and maize are grown by almost all families. Large cardamom, ginger, turmeric is major spices orange, pears, banana and pineapple are the major horticultural crops. Farmers do not use any external inputs for nutrient and pest management. Jhum cultivation is widely practice in the area but gradually it is reduced as introduction of large cardamom has changed the trend to have settled agriculture. First year farmers clean the forest area and go for mixed cropping with large cardamom. The major field crops are....

Paddy: In April-May people do jhum paddy sowing on hills with moderate slope and TRC/WRC paddy in June-July on valley type land.

Maize: Farmers sow maize in two different seasons. In Kharif maize is sown during March-April and Rabi season in Sept.

Vegetable: Most of the families grow leafy vegetable, chilli, pumpkin, squash, cucumber and coriander as intercrop with large cardamom during 1st year of plantation. They also grow vegetable in jhum cultivation. Almost every family grows vegetable for their own consumption and a little surplus they sold it to the market. Few village traders aggregate their produce and take it to Naharlagun markets.

Ginger: Farmers grow ginger in the moderately steep sloping hills with deep fine soils. They follow shifting cultivation method in ginger as they do not grow ginger in the same field next year. The area under ginger cultivation is getting reduced day by day. It is mainly due to marketing problem. The production risk (ginger rot) is also increasing.

Large cardamom: During last four-five years large cardamom has been popularized in the block. Farmers are mostly converted their existing field and also creating new area for expansion.

Jhum cultivation: Most of the people in this village practice jhum cultivation. The preparation of jhum cultivation is start from February, March harvesting time September, October. According to the people very hard labour and not much profit compared to hard work and if the weather condition is not in favour. Preparing jhum include cutting down the tree, burning the trees, cleaning. The crops cultivated in

jhum are namely, rice, chilli, pumpkin, cucumber, maize, green leaf vegetable, ginger, turmeric. Etc.

- Use broadcasting method
- No external inputs
- Use traditional seed (own seed)

Production practices, productivity, issues, challenges

Crop	Production practices	Challenges shared by SHG members
Paddy	**Production practice** • Farmers grow paddy on valley land and practice WRC(Wet rice cultivation) • Rainfed paddy • All the family follow traditional practices but most of the family transplant single seedling. • Age of seedling varies among farmers 35-45 days • Seed rate varies • Seed replacement almost nil, farmers use local variety • Seed treatment not in practice • Farmers do not use any external inputs. **Productivity** As farmers are not aware of the measurement of their land it is difficult to measure the productivity of paddy. However an rough estimation indicates the productivity in the range of 500-600 kg per acre i.e. 1200 – 1500 kg/Ha This is lower than the productivity can be achieved in line transplantation or SRI (4000-5000 KG/Ha)	• Water crisis during transplantation- On time sowing/transplantation is a major challenge as it is rainfed agriculture. • Sand deposit on the field due to excessive rain. • Complete washout of the crop due to excessive rain. • Disease and pest – Leaf hopper/roller and gundhi bag
Ginger	• Farmers are using same rhizome years after years and no varietal change • Few farmers sow rhizome directly from other field. • Ginger exhaust nutrients from the soil, even no external inputs are added on land • Very few farmers do line sowing • Seed rate varies among farmers (depends on the land position and soil type) **Productivity** Production related data are available but as land measurement is a real difficult proposition, study team explored the conversion rate like how much rhizome was used how much produce harvested.	• Fungal attack-ginger soft rot • Heavy rainfall damages the production • Farmers get very low rate of their produce and gradually no of farmers are decreasing.

	It was noted that the conversion ratio was 1: 5 or 6. This ratio is at lower side as this may be increased upto 1: 8	
Large cardamom	• Most of the farmers in the area prefer to use local saplings, because it is easily available and cheap. • Few farmers tried the sapling from Sikkim but those saplings did not survive. • The major investment goes in preparing the land in terms of labour and also for fencing. • Usually the pits are taken at a size of 2 ft x 2ft x 1 ft each. The pits are dug at a distance of 1.5 m x 1.5m to 2m x 2m on either side. • Farmers are planting Sowney or Ramsey variety • There is wide variance in terms of following the orchard management practices. Farmers are mostly following what other farmers suggest. • No external inputs are used, resulting low production. • Production are affected due to widespread occurrence of fungal and viral diseases • Among pests, leaf caterpillars and stem borers dominate. Aphids are responsible for transmitting furki	• Farmers do not get quality sapling for area expansion • Farmers did not receive any training, less aware of standard practices • Production are affected due to widespread occurrence of fungal and viral diseases • Fluctuating market rate
Vegetable	• Vegetable is mostly grown for the purpose of own consumption • Almost all households grow leafy vegetable like lia patta, chilli, king chilli and pumpkin • No external inputs are used • Production is high during Aug-Sept.	• Non availability of quality seeds • Damage of seedling in nursery • Disease and pest • As the production quantity is less traders come to procure very irregularly.
Fishery	• More than 30% of the families (in the sample villages) have water bodies and do fish farming • No proper pond management practices exist	• Underutilization of water resources • Siltation in the water bodies, shallow water • Farmers do not have

	• Number of fingerlings per unit area varies • Varietal combination is not practiced (put fingerlings as per availability or suggested by supplier • Most of the farmers do not use any external feed • Netting done very less No • No ccommercial production outlook • Very low investment in the activity. -	technical knowledge on fish farming • Availability of quality fish spawn and fingerlings is a real concern
Livestock-Pig	• Almost all households rare pig • Open grazing is the most common practice • Very few farmers use concentrate to feed the pig • No de-worming or vaccination • Hampshire cross of pig • Yorkshire not preferred by farmers	• Availability of piglets, particularly after Christmas • Low growth • Disease

Members' perspective on improving the livelihoods

Village	Members preferences and choice		Reason	Members perspective on improving the livelihoods
	Rank	Livelihood Activity		
Jath	1	Large cardamom	Almost every family is engaged and already invested a lot	14. Training on improved practices to enhance production and disease management in Cardamom, paddy and vegetable 15. Drainage, channel to divert water from paddy field during heavy rain will reduce sand deposition, complete wash out of paddy. 16. Linkage with outside buyer for better price in large cardamom, formation of a committee within village who
	1	Paddy	Food security	
	2	Vegetable-Chilli & King chilli	Low risk, everybody involved, profitable and family consumption	
	3	Pig	Every household involved, profitable, no marketing problem	
	4	Fishery	Almost 30% people have pond, there is demand and very low production as members do not know the scientific practices	
	4	Business	High profit, many SHG	

			members involved in business, capital support can increase business size.	will regulate the price. 17. Capital support to enhance size of the activity and business
	1	Large cardamom	Almost every family is engaged and already invested a lot	
Lumri	2	Vegetable	Low risk, everybody involved-doing commercially, profitable and family consumption	18. Increased vegetable production will streamline supply, many traders will come to village.
	3	Pig	Every household involved, profitable, no marketing problem	
	4	Paddy	Everybody involved but have sufficient production for household consumption, increased production will help them to sell surplus produce.	

Seasonality analysis

Crop	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Remarks
Large Cardamom	C H	C	LP	P			W		W		H	H	Harvesting in 3rd year
Paddy			LP	N		TP			H (90 D)	H (120 D)			
Maize	LP H(mature)	LP	S	W		H (Small)	LP	H (mature) S	W	W	W	H (small)	
Chilly	LP	LP	N		P	W	W	W	H	H	H	H	
Vegetable	H	H							LP	S	H	H	
Orange	H	H					W		W			H	
Ginger		LP	S		W		W		W			H	

*C= Cleaning, LP= Land preparation, S= Sowing, N= Nursery, P, Plantation, T= Transplantation, E= Earthing up, W= Weeding, H= Harvesting, HP= Peak Harvest

Stakeholder consultation

Team interacted with the district and block level stakeholders like Agriculture, Horticulture, Animal Husbandry and KVK to share the primary observation made in the field, understand their perspective, development/department's priorities and scope of convergence.

Research and extension based institution (ICAR/KVK)

Name of institution	KVK
Name and designation, contact no of the person	Ms. Hage Munth-Soil Scientist, Dr.S.K.Chaturbedy-SMS-Horticulture-8259822664
Current scenario in production/post production – challenges/success	**Soil** Productivity is less than the potential, no use of external inputs, soil is acidic in nature. (PH is 3.5 -5) which is not good for good production. Soil is mostly deficient in P. Nitrogen and potash is also deficient. Farmers are gradually shifting from Jhum to Settle agriculture. **Large cardamom-** Soil PH is acidic, for Cardamom 5.5 to 6 PH is required. Farmers are planting Sowney or Ramsey variety Viral attack-Chirki& furki Aphid (pentalonia nigro lerbosa) vector POP not standardised Absence of honey bee colony result less pollination Heavy rainfall also affects pollination. Without soil test farmers go for plantation in everywhere. **Ginger** No varietal change, farmers using same rhizome years after years Fungal attack-ginger soft rot No external inputs, ginger exhaust nutrients
New technology/varieties	Cardamom- Sowney, Ramsey Ginger-Nadia Pea-PB-89 Onion-dark red Nasik NHRDF, AF light red
challenges in technology transfer	Acceptability to new technology is a major challenge, systemic orchard and crop management requires intensive engagement, labour is a problem.
Extension services	Farmers Training and awareness, FLD program
Programs, schemes	FLD under various research and extension schemes
Key recommendations,	**Soil improvement-** Awareness on soil PH-soil test and application of lime Application of external inputs Stripping pulses, intercropping with pulses Terracing – log bunding **Large cardamom** Promotion of honey bee colony Planting density 1.5 m x 1.5 m Popularizing standard POP Maintaining shed on field through plantation

	Systemic orchard management Terrace planting for better nutrient and water management **Ginger** Popularize variety – Nadia Seed treatment Nutrient management Systemic orchard management Changing cropping sequence – Ginger-legumes-veg+legumes-Ginger **Vegetable** Promotion of short duration vegetable like leafy vegetable, carrots Promotion of pea – PB-89 variety Promotion of onion in both Summer and winter
Scope of convergence	Training of farmers Demonstration of standard POP under FLD program can be done selected farmers from SHG Issuing Soil health card

Line departments (Agri/Horti)

Name of Dept.	**Agriculture**
Name and designation, contact no of the person	Joram Robi-ADO (Ziro), 8119916225
Current scenario in production/post production – challenges/success	Seed replacement ratio is very poor SRI is not feasible as it requires intensive engagement and labour is a problem No use of external inputs, only crop residue is the source of N,P.K so soil is Nutrient deficient
New technology/varieties	Department tried to introduce high yielding rice varieties like Ranjit, IR-36 but very low response from farmers as they prefer (food habit) to grow local variety
Area, production, productivity data of major produces	Not available
Major diseases and pest and controlling mechanism	No such major diseases and pest infestation, only leaf hopper, roller and Gundhibug. There is no controlling measures taken by farmers
Soil quality, deficiency of nutrient	No use of external inputs, only crop residue is the source of N,P.K so soil is Nutrient deficient
Ongoing program/schemes	RKVY, NFSM, mission organic, Pradhan Mantri Krishi Sinchayee Yojana
Major challenges in technology transfer	Farmers are not ready to change their variety, change in practices is difficult if it is labour intensive. Farm mechanisation is problem because of terrain and scattered land
Key recommendations for ArSRLM	Awareness on seed replacement and use of organic inputs for nutrition management, introduction of pulses

	after rice, ensuring intercultural practices, earthing up and weed management in Ginger, encourage farmers to use improve variety like Nadia, high yielding rice variety like ranjit, IR-36
Scope of convergence	Training of farmers, demonstration of new technology, varieties through FLD, farm mechanization

Animal resource department

Name of Dept.	**Animal Resource**
Name and designation, contact no of the person	Dr. B. Tacho, Veterinary Officer-9436227231
Current scenario in production/post production – challenges/success	Maintenance of cold chain is a major challenge, effectiveness of vaccine is under question. Diseases broke out even after vaccination. Time to time potency check is required at state, district and block level. Vaccination and de-worming done regularly, de-worming done for most of the animal but vaccination is a problem (due to availability and cold chain maintenance), nearly 60% done.
New technology/breed	Hampshire cross of pig Yorkshire not preferred by farmers
Major diseases	Swine fever during winter and FMD
Outreach, availability of medicine, Acceptability of vet care service,	Vaccination and de-worming done regularly, de-worming done for most of the animal but vaccination is a problem (due to availability and cold chain maintenance), nearly 60% done.
Ongoing program/schemes	
Major challenges in production	Availability of good quality piglets is another challenge. Most of the piglets are purchased from Assam during Nov-Dec (high demand during this period) which are not always vaccinated.
Key recommendations for ArSRLM	Conducting mass Awareness and animal health camps + Regular de-worming and mineral supplementation Encouraging farmers for breeding unit Scientific raring in pig sty and maintenance of hygiene.
Scope of convergence	Training of farmers, Animal health camp

Recommendation and suggestion

Production Aspects

Livelihoods activity	Recommendation
Paddy	• Promotion of SRI/improved method of paddy cultivation (seed treatment, young seedling, line sowing, weeder application) with proper water management systems like drainage and bunding • Seed replacement • Varietal change (as per agriculture dept. suggestion IR-36, Ranjit etc.) for surplus production, not for food security, as local people do not prefer to eat other rice variety. • Application of green manuring for management of soil nutrient requirement though natural practice. • Use of organic inputs (converting biomass) • Proper water management through creation of channels, diversion and making seepage tank where fish can also be grown. • Use of bio-pesticides to control pest and insects • Promotion of pulses and oilseeds after paddy harvesting
Ginger	• Training on seed conservation/storage and systemic orchard management • Popularize variety – Nadia • Seed treatment • Sowing in furrow/mulching • Nutrient management – conversion of biomass into organic inputs • Changing cropping sequence – Ginger-legumes-veg+legumes-Ginger • Mulching with locally available weed biomass
Large cardamom	• Training of farmers on plantation techniques and Systemic orchard management • Awareness on soil PH-soil test and application of lime • Application of external inputs- decomposed biomass • Stripping pulses, intercropping with pulses in 1st and 2nd year of production (when vegetative growth is less) • Terracing – log bunding • Maintaining shed on field through plantation • Terrace planting for better nutrient and water management • Promote virus free seedling growing area in convergence with Spice Board
Vegetable	• Intensifying vegetable production in those villages where people are doing it with commercial outlook.

	• Training on nursery management • Use of organic inputs through conversion of biomass • Use of bio-pesticides to control pest and insects • Promotion of short duration vegetable like leafy vegetable, carrots • Promotion of pea – PB-89 variety • Promotion of onion in both Summer and winter
Fishery	• Convergence with MGNREGA/own investment to increase the depth of the water bodies and proper bunding • Training of farmers on pond management, use of feed, disease management, varietal combination • Model Fish farming demonstration
Livestock-Pig	• Conducting mass Awareness and animal health camps + Regular de-worming and mineral supplementation • Encouraging farmers for breeding unit • Scientific raring in pig sty and maintenance of hygiene. • Encouraging few farmers for breeding unit

Market aspect

Local Markets study

Team visited local market, transit market at the district level, state level and also neighbouring state like Assam to understand the flow of the commodities (mainly vegetable and ginger), quantum of supply, traders and price variation, market systems etc. Team had Interaction with traders/wholesalers/retailer to understand demand and supply analysis, market size, price variation/trend, actors and their functions , Identifying scope on intervention.

A. Village level price trend analysis of selected crops
   Team conducted focus group discussion with farmers to know the price trend of major produce in current year (Jan-Dec, 2016). The price trends are mentioned below.

Crop	**Price**											
	Jan	Feb	Mar	Apr	May	June	July	Aug	Sep	Oct	Nov	Dec
Large cardamom (Elachi)										700	1000	1000
Orange per kg	80	80								30	30	50
Ginger per Kg	10	10	30	30						20	10	10
Kingchilli									200	200	200	200
Chilli	200	200	200	200	200	200	50	50	50	50	50	50

normal per kg	(dry)	(dry)	(dry)	(dry)	(dry)	(dry)						
Broom per kg	30	30	30	30	30	30	30	30	30	30	30	30
Pear (Neshpati) per bag							100	100				
Pineapple							30	30	30	30		
Squash								15	15	15	15	15

The team visited following primary markets

1. Naharlagun
2. Itanagar

Market Name	Distance from Block H.Q	Villages that access this market
Naharlagun	90 km	Farmers from villages do not have access to any market. Trader from local area and Naharlagun collect the produce (vegetable) from village and sell in Naharlagun and Itanagar
Itanagar	100 km	

Features of major markets

Features	**Naharlagun**	**Itanagar**
Periodicity	Daily, Sunday and Wednesday are weekdays market	Tower chawk-Wholesale and retail (daily) Ganga market-Retail (daily)
Size (Retail, Wholesale)	Most of the retailers are women except 5-6 retailers who are from outside do vegetable retailing in the market. Most of the retailers (around 50) sell local vegetable and 5 retailers (outsider) sell other vegetables.	The wholesale market is very small, around 10-12 traders who buy vegetable from Holongi market (Wholesale market near Arunachal-Assam border) bring it to tower chawk in SUMO (10 numbers). Beside them 4 vehicles (TATA mobile-207). Daily inflow of vegetable is around Rs. 60000-80000
Major vegetable/other products supplied (quantify)	Local vegetable comes from yachuli, ziro, Sagalee, palin, Daporijo and Minigio but very less in quantity. Leafy vegetable like	Majority of the produce are supplied from Holongi market. Tomato comes from Bomdila. Local vegetables like leafy

E) targeted block – F) Other area (mention)	laipatta, coriander, chilli, vegetable collected from forest are the major vegetable flow from the above blocks. In season like Aug-Nov 4-5 vehicles (TATA Mobile) reach to the market. In other season, vegetable supply from local area is very less only 1-2 vehicle (TATA Mobile). Local growers from those block rarely come with their produce. The average value of vegetable in one vehicle is around Rs.20000 to 25000. So in peak season vegetable of value around Rs. 1 lac per week fed into the market. Beside the local produce other vegetable (tomato, cabbage, cauliflower, carrot, beans, brinjal (local),broccoli etc, comes from Harmoti. Weekly supply is around 4-5 vehicles (TATA Mobile). On Sunday and Wednesday the inflow of vegetable from Harmoti increases upto 20-30 vehicle (TATA Mobile).	vegetables, chilli and ginger come from Ziro, Palin etc.
Peak Demand period	March-June when local vegetables are less available	March-June when local vegetables are less available
Peak Supply period	Aug-Feb almost all varieties of winter vegetables are grown in the local area.	Aug-Feb almost all varieties of winter vegetables are grown in the local area
Supply Chain (forward)	Vegetable- Local growers sell to traders who collect from different places and bring to Naharlagun Market. Retailers buy from the trader.	Local growers sell to traders who collect from different places and bring to Itanagar Market. Traders buy vegetable from Holongi (a wholesale market in Assam-Arunachal market). They sale their vegetable in wholesale in Tower chowk. Retailers buy from them and sell in Ganga market which is a daily market.
Supply to places	No supply. Vegetable inflow from Assam. This market does not supply any vegetable to outside.	No supply. Vegetable inflow from Assam. This market does not supply any vegetable to outside.

Challenges faced by retailer, wholesaler	• People prefer to consume local produce, mainly leafy vegetable, the supplies are less in compare to demand. • Transportation cost is very high, so traders margin are less. • Production in the village are very less so sometime it's difficult to get minimum volume making it cost effective.
Recommendation by wholesaler/retailer on product quality, procurement, transportation, handling etc.	Increase in production will ensure regular inflow of local vegetable into the market as traders will procure produce from village on regular basis and transportation cost can also be minimised if the volume increases.
Scope of intervention	There is less scope on intervention in market side as critical volume for aggregation at the village level is very low. So unless the production increases, less scope for market side intervention.

Price realization across the chain

Commodity	Producer level	Wholesaler	Commission agent	retailer
Cabbage		40	NA	50-60
Laipatta	10	20	NA	30
Mustard leaf	5	10	NA	30
Wild potato	10	30	NA	40
Tomato		70	NA	80-90
Chilli	40	60	NA	80

Vegetable inflow from Harmoti market

Season	Jan-March	July-Sept	Nov-Dec
Major Vegetable	Cabbage, Cauliflower, Tomato, brinjal, potato, chilli	Cabbage, tomato, pointed guard, Ladies finger, cucumber	Cabbage, Cauliflower, Tomato, brinjal, potato, chilli, radish, palak,
Quantity	50% of vegetable supplied in Nov-Dec		Sunday market – 10 Truckload Wednesday market – 5 truckload Friday – 2 truckload
Source of produce	Bomdila, Shillong, Barpeta, karpetia		
Note: one truckload is 9 MT of vegetable			

Acknowledgements:

1. www.thegreenerpastures.com
2. CGWB annual reports.
3. www.censusindia.net
4. Distrcit Agriculture Deptts. (Roing, Namsai, Yachuli & Ziro)