

**PIG PRODUCTION, MANAGAMENT AND
MARKETING IN THE NORTH EAST INDIAN STATE
OF NAGALAND**

**A SITUATION ANALYSIS
NEPED-SRTT LIVELIHOOD INITIATIVE**

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List of acronyms

NEPED	Nagaland Empowerment of people through Economic Development
DRDA	District rural Development Agency
ICAR	Indian Council for Agricultural Research

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Executive Summary

The NEPED-SRTT livelihood framework for the state of Nagaland through community based piggery project addresses some of the basic constraints that constrain the productivity and profitability of piggery in 50 villages spread over 10 districts. The project's main interventions are:

- Better utilization of available non-conventional feed ingredients
- Improving housing system to reduce feed loss, better hygiene and production
- Community based pig disease prevention and control
- Capacity building

The situation analysis was conducted to establish the current status of pig production, management and marketing. The specific objectives of the baseline survey were to:

- establish the baseline conditions for pig management, production, productivity and marketing in Nagaland
- establish the determinants of pig productivity
- determine the areas of intervention to enhance pig production, productivity, management and marketing improvement
- determine the interventions for gender related issues in pig owning households

The study was conducted in four districts of Mokokchung, Wokha, Phek and Kohima. A total of 253 households were interviewed, 116 selected randomly in project villages and 76 selected randomly from control (non-project) villages. Sixty one households were breeder or propagation households already selected by the project.

The main occupation of the households was crop farming and off farm income (salaried employees). Each household owned an average of 11 acres. A third of this land was cultivated during the wet season. During the dry season, the land cultivated reduced by 87 percent of the amount cultivated during the wet season. The respondents mainly owned small livestock mainly chickens and pigs. On average 2 pigs were owned by the household. The pig owning households had more livelihood sources than non pig owning households.

Access to services by the households was limited. Only 9% of the households were visited by an extension officer in the past year while only 2% had been trained on pig production. Credit was accessed by a third of the respondents mainly to cover household expenditure with 30% of the loans being re-invested in agriculture. About 20% of the households had health insurance.

Farmers kept different pig breeds. Fifty four percent of the households kept large black pig breed, 21% the indigenous/local breeds and 13% the cross breeds. For households keeping exotic breeds, the main reason was because of their rapid growth rates. Thirty seven percent of the entire sample practised controlled mating to increase number of piglets and reduce piglet mortality. The practice of hiring boars for mating was common

with 80% of the pig keepers having hired a boar for mating their sows. Only 14% of the pig keeping households used a boar from their own herd. The main constraints to breeding were given as lack of knowledge on good breeding practices, and how to identify the best breeds/cross breeds to use.

The main feeding practice was sty feeding (89%) with only 9% of the households using the free range feeding system. There was a big variation across districts with 48% of the households in Phek using free range. Some of the households experienced acute feeds shortage in the 12 months prior to the survey particularly those in Phek and Wokha districts where 69% and 63% of households respectively experienced feed shortages. The main constraints to pig feeding were high costs of feeds, time requirement to collect feeds, lack of fuel wood to cook the feed and difficulty in transportation.

The majority of the households housed their pigs all the time, with exception to households from Phek where 52% of the households housed their pigs. Piglets were prioritised animals for housing during the dry and wet seasons. Fifty eight percent of the households had a compost pit to collect the waste from the sty. Ninety five percent of the households had constructed a feeding trough/manger in the sty and out of these 36% reported that the manger was at a higher level than the rest of the sty.

The most common diseases and parasites affecting pigs were worms and swine fever across all households. A third of the households treated disease and symptoms by using the traditional medicine while the same proportion used conventional medicine. Parasites, fever and worms were treated with conventional medicine while foot and mouth, swine fever and wounds were mainly treated through traditional methods.

More women were involved in feeding and cleaning the pigs while men were involved in medication and marketing. In 85% of the households, women cooked the feed while men cooked the feed in only 12% of the households. Young girls were only involved in cleaning the sty and feeding the animals.

For households keeping Burmese, the mean number of piglets per sow was 14 compared to the large black that had a mean number of piglets of 8.0. Indigenous breeds had an average of 6.9 piglets per sow. Despite the Burmese having the highest average number of piglets born, it also had the highest number that died at birth. Sixty four percent of Burmese piglets reached weaning stage compared to the Large Black (80%) and the Indigenous breeds (78.2%). Other than the breed, housing, feeding practice and the number of times the sow had given birth influenced the productivity. Pig housing, on average, leads to litter size of 3 more piglets, while increase in adoption of large black breed type results in 6 more piglets.

The total mean income for the four districts was 46,260 Rupees. Phek had the lowest income (24,600) and Mokokchung the highest income (66,339). The mean incomes

from sale of pigs was (8,633), piglets (23,133), pork income (5,525) and sale of manure (4,333). Non-farm income accounted for the highest proportion of the total household income (74%) followed by income from pigs which was 15% of the total household income. The trend was similar across the different districts except in Kohima district where other livestock income accounted for 12% while pig income accounted for 7% of the household income. Pig income was derived from three sources, the sale of piglets, pigs and pork meat of the slaughtered pig. Sale of pork contributed the highest to pig income. Most of the sales were done at farm gate or in the village market.

1 Introduction

1.1 Background

Three hundred million poor people in Asia depend on livestock for their livelihoods and there are opportunities for improvement in livestock related livelihoods due to the rapid and dynamic changes that the livestock sector in Asia is undergoing. Most households in tribal, hilly and other marginalized groups rely on livestock for their livelihoods: 60-90% of rural families in NE India keep a few pigs (Deka and Thorpe, 2008). In the North East Indian State of Nagaland, the livelihoods of the people depend on agriculture and natural resources. However, increasing population pressure and changing lifestyle of the Nagas, has posed challenges for meeting the livelihood needs, sustaining their environmental resource due to poverty, natural resource degradation, and depleting returns for production systems. Consequently, increased instances of transition from shifting cultivation to more integrated farming have been reported. Small land holders in Nagaland are adopting more profitable and less labour intensive backyard pig production to increase cash returns, and accumulate capital in banks. Pig keeping also contributes to socio-cultural obligations and risk diversification and converts existing resources and low value waste products into high-value animal source food for home consumption and/or sale (NEPED, 2008).

The human-pig ratio in Nagaland reported in the 2003 livestock census was 3:1 compared to the national ratio of 76:1, - the highest recorded in the country. The state also has the highest per capita consumption of pork. In 2004-05 the state recorded slaughtering 386,000 pigs with net yield of 29,350 MT of pork meat (Basic Animal Husbandry Statistics, Department of AH & Dairying, Ministry of Agriculture, GOI). The pig population in rural Nagaland is twice the population in the urban areas (Table 1).

Table 1: Pig population in Nagaland

DISTRICT	TOTAL	EXOTIC	INDIGENOUS
Kohima	33,844	24,680	9,164
Mokokchung	63,074	43,486	19,588
Tuensang	49,546	27,041	22,505
Zunheboto	113,101	24,262	88,839
Wokha	80,411	31,640	48,771
Phek	61,261	28,812	32,449
Mon	37,174	22,167	15,007
Dimapur	145,276	98,123	47,153
Longleng	10,950	5,269	5,681
Kiphire	22,567	13,284	9,284
Peren	27,010	18,111	8,899
Total	644,214	336,845	307,339
URBAN	125,393	RURAL	518,821

Source: Veterinary & Animal Health Department, 17th Quinquennial Census, 2003

Between 1982 and 1992, the pig population grew by 112%. Despite these growth rates, a deficit between pork meat production and demand has been recorded in the same period. The challenge is to ensure that the state can produce enough pork for the domestic demand while at the same time ensuring that pig producing families benefit from the growing market by: (i) increase the levels of productivity, in a sustainable manner, to increase marketable surplus. This requires access to appropriate technologies including better animal breeds, feeds and health services as well as credit facilities and risk reduction mechanisms such as insurance; (ii) ensuring that producers can access markets through appropriate institutional arrangements that allow markets to function efficiently; and (iii) ensuring an enabling policy environment that encourages and promotes the appropriate input supplies & services and market institutions, including encouraging private sector to play a full role.

Several initiatives have contributed significantly to the potential for pig production and improvement as a source of livelihoods for small holders in Nagaland. The government led efforts include piglet propagation and distribution of piglets, introduction of a background piggery scheme and the provision of credit to self help groups, training and extension service to identified villages by NGO initiatives. A rapid appraisal of the pig production in Nagaland was conducted in early 2007, by the Nagaland Empowerment of people through Economic Development (NEPED) in its 63 project villages to ascertain the role and importance of pigs in Nagaland. Almost every household kept between one and two pigs which played a crucial role in earning additional family income and provided preferred meat for festive seasons. Pigs were mainly reared for meat, while wealthier families' were breeding sows and boars. Preferences have also graduated from indigenous pigs (Tenyi Vo) to cross/exotic breeds mainly due to better growth rate and feed conversion efficiency. Major constraints faced by project villages in advancing productivity and profitability of pig are lack of resources to buy piglets, disease problems, lack of confidence to rear breeding sows and ignorance of feed and feeding practices.

1.2 Project Description

The NEPED-SRTT livelihood framework for the state of Nagaland through community based piggery project addresses some of the basic constraints that restraint the productivity and profitability of piggery in 50 villages spread over 10 districts. A lot of interventions are required to enhance pig production. The main interventions are:

- Better utilization of available non-conventional feed ingredients
- Improve housing system to reduce feed loss, better hygiene and production
- Community based pig disease prevention and control
- Capacity building

Under each of these key components (Table 2), the project has a set of activities and expected outputs and outcomes.

Table 2: Key project activities

Component	Key Activities
Piglet production	<ul style="list-style-type: none">• A baseline survey in all the proposed villages using structured questionnaire• Identification of breeding families and propagation• Training of community particularly breeder's families on care and management• Purchase and supply of breeding stock
Feeding	<ul style="list-style-type: none">• Conduct sweet potato trials• Awareness creation on improved feeding• Farmer-partners training on silage production• Nutrient estimation and formulation of sweet potato based diet• Outcomes year as well as save time and labour spend on collecting tree branches and cooking pig feed.
Housing	<ul style="list-style-type: none">• Design and construct a low cost pig corral making use of some locally available building materials.• Support the cost of CGI sheets, sand and cement up to Rs.2500 per pig.• Site levelling, locally available building materials
Health	<ul style="list-style-type: none">• Community sensitization and awareness on epidemiology of endemic pig disease• Identify and train community animal health workers• Equip Village Animal Health Worker (VAHW) will be e with vaccine cold box and vaccination kit• Organize for vaccination of all pigs irrespective of project pigs or not to guarantee complete bio-security and freedom from swine fever or FMD.
Capacity building	<ul style="list-style-type: none">• Awareness trainings on pig economics, livestock and environment, pig diseases their prevention and control, piggery sanitation and human health• Hands on training on ensilaging of feed, handling of cold chain equipment and delivery of vaccines

1.3 Objectives of the situational analysis

The situational analysis was conducted to establish basic information on community livelihood in relation to pig rearing. The specific objectives of the baseline survey were to:

- i. establish the baseline conditions for pig management, production, productivity and marketing in Nagaland
- ii. establish the determinants of pig productivity

- iii. determine the areas of intervention to enhance pig production, productivity, management and marketing improvement
- iv. determine the interventions for gender related issues in pig owning households

1.4 Outline of the report

The methodology of this study is presented in section two. In the subsequent sections, the results are presented in four sub sections from section three to six. These sub sections include pig production, management, productivity; gender issues in pig production, food security, and access to services. In section three the household characteristics particularly the land and asset ownership characteristics across gender, access to services, livelihood strategies and food security are shown. In section four, the pig management, production and productivity practices are presented. In this section the breeding practices and preferred breeds in the sampled districts are given. The factors that affect the productivity of piglets using an ordinary least squares model (OLS) are also presented. In section five the key constraints of pig production and management are presented and in section 6 are the marketing characteristics and role of pigs in household income. Section 7 summarizes the key findings and conclusions.

2 Methodology

2.1 Site selection

The project is implemented in Nagaland, a north eastern state of India (Figure 1). Within the ten districts that were selected with exception to Dimapur¹, the project activities were implemented in 26 villages. Each selected district had 2 or more villages and some had less than 2 villages. Four districts were selected for the survey and these were selected based on diversity in agricultural practices and market access. These are Mokokchung, Wokha, Phek and Kohima. Mokokchung, Wokha and Kohima have internal borders while Phek shares a border with Myanmar.

¹ as NEPED has no district staff in this location

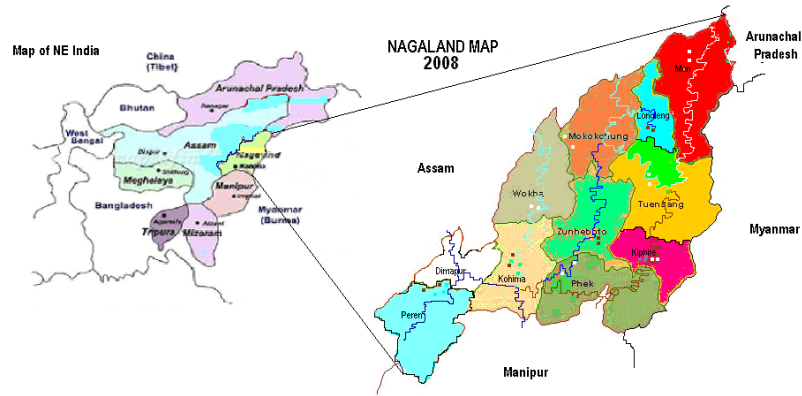


Figure 1: The map of Nagaland with selected districts

2.2 Sampling

Sampling was conducted at four levels as shown in Table 3. These levels were the district, village, household and whether the household owned a pig. On average, each village has between 200 to 250 households. In each of these 4 districts, 2 villages were randomly selected for the baseline situational assessment. A further 4 villages were selected to provide a control group for each 2 selected village. The control village was selected randomly in each representative district. The control village was sufficiently distant from project activity villages to ensure that no spillover effects will be present however.

Table 3: Site selection and characterization

Hierarchies	Sample size per level	Method of sampling	Sampling Frame
District	4 (A) Kohima, (B) Mokokchung, (C) Phek and (D) Wokha	Selected as representative of each district type	10 districts in Nagaland
Villages	2 + 1 control	Random	List of villages
Households A	18	Random	List of all households in village
Households B	Breeder & Propagation project households	All surveyed (in project villages only)	All project households

The sample size for households was guided by resource availability. Eighteen households were randomly sampled in each village. In addition, the pre-selected households who participated in the project (on average, 5 breeders and 2 propagation respondents) were surveyed. As a result total sample size per each project village was 25, while in control villages 18 households were interviewed. The random selection of the 18 households allowed us to a) estimate proportion of pig-farmers in project villages, b) compare the livelihood sources of pig and non-pig owning farmers, c)

identify changes during the project such as households changing their pig-ownership status amongst other variables.

For the baseline survey, sampling of households within villages represents clustered sampling. Additionally, multiple households within a village allow us to estimate means and variations across various parameters. Analysis of household data incorporates this design hierarchy to account for the 'between household' correlation within a village. Random sampling of the non-project households within a village was conducted, from a list of all households in the village. In addition, all initial project households (on average, 2 propagation and 5 breeders) were visited.

A total of 253 households were interviewed (Table 4). One hundred and sixteen of these households were selected randomly in project villages; 76 were selected randomly from control (non-project) villages while 61 households were sampled purposively from households involved in the project and selected either as breeder or propagation households.

Table 4: Households interviewed by type, village and District

District	Village	Random households	Control households	Total
Kohima	Kezo Basa	17	0	17
	Sendenyu	0	20	20
	Tsise Basa	16	0	16
	Total	33	20	53
Mokokchung	Kupza	20	0	20
	Mangmetong	19	0	19
	Ungma	0	18	18
	Total	39	18	57
Phek	Chozuba	12	0	12
	Dzulha	12	0	12
	Khulazo Basa	0	20	20
	Total	24	20	44
Wokha	Englan	14	0	14
	Koio	0	18	18
	Okhyeyan	6	0	6
	Total	20	18	38
Total		116	76	192

The results have been analysed for the whole sample, pig and non pig owning and by district. Mokokchung district had the highest number of project households (39) followed by Kohima (33) while Wokha had the lowest number of project households (20). In this analysis we have excluded the purposively selected project households.

2.3 Analysis

Descriptive statistics were generated from the data using the Statistical Program for Social Sciences (SPSS 17.0). The descriptive statistics included percentages, frequencies and cross tabulations generated by the four sample districts and pig ownership characteristics for the non production related characteristics such as the livelihood strategy, food security, access to information and services. STATA 10 was used was used to subject the data to an Exploratory Data Analysis (EDA), using the coefficients' of Skewness and Kurtosis used to measure the normality of the data. After the data were cleaned, the quantitative analysis was used to measure the important factors that affected productivity.

The ordinary Least Squares model was used to measure the determinants of pig productivity. A number of explanatory variables have an influence on the productivity of the pigs. The vector of explanatory variables for the productivity of pigs and their hypothesized relationships with the explanatory variables is shown in Table 5. These variables only include production factors.

Table 5: Summary of the hypothesis

Variable description	Variable	Hypothesis
Dependant Variable		
Number of piglets born		
Independent Variables		
Sow housed (1=yes, 0=no)	Dummy	+
Breed type (0=indigenous, 1=Burmese, 2=large black)	Dichotomus	
Sow dewormed (1=yes, 0=no)	Dummy	+
Current age of the sow (in months)	Continuous	-
Feeding practise (0=sty feeding , 1=scavenging)	Dummy	+
Number of times given birth		

Using initial analysis comparing individual variables to litter size this was then developed into a multi-variable regression model, specified as follows;

- **Dewormed sow:** De worming a sow is expected to have a positive correlation with the number of piglets born
- **Current age of the sow:** the current age of the sow is hypothesized to have a positive effect on the number of piglets born
- **Feeding practise:** Sty feeding is expected to improve the nutrition and diet of the piglet therefore result in higher productivity.

- **Housing of the sow:** Whether the sow was housed was hypothesized to be positively correlated to the number of pigs that were born.
- **Breed type:** The use of improved breed was expected to have a positive influence on the number of piglets born.

3 Household Characteristics

3.1 Household Characteristics

The mean household size was 5 members with a maximum family size of 12 persons. Phek and Wokha districts had a higher mean household size of 6 members (Table 6). Ninety two percent of the households interviewed were male headed. Across districts, Kohima had the largest number of female headed households at 18% while Mokokchung did not have any female headed households in the sample.

Thirty five percent of the household heads had high school level of education while 30% had no formal education. Education levels varied greatly across districts. In Kohima, there was an even distribution of households across the different education levels ranging from no formal education to high school education. In Mokokchung and Phek, almost 50% of the household heads had high school education.

Table 6: Household Characteristics

District	Kohima	Mokokchung	Phek	Wokha	Total
Age of head (years)	48	54	47	51	50
Household Size (#)	5	4	6	6	5
Gender (%)					
Male	81	100	98	87	92
Female	19	-	2	13	8
Level of education (%)					
High school	17	45	43	34	35
Middle school	15	16	27	26	20
No formal and illiterate	19	21	16	18	19
No formal but literate	25	9	2	5	11
Primary	21	-	9	11	10
College & University	4	9	-	3	5
Primary activity of head (%)					
Crop farming	72	63	93	37	67
Salaried employee	21	21	5	21	17
Old/retired	2	9	2	13	6
Wage earner/labourer	-	-	-	21	4
Trader/business	2	4	-	3	2
Livestock and poultry keeping	4	2	-	-	2
Domestic work	-	-	-	5	1
Livestock and livestock product trading	-	2	-	-	1

Across the whole sample, the main primary activities for the heads of household were crop farming (67%) and salaried employment (17%). There were variations across

districts with 93% of the household heads from Phek being engaged in crop farming while 21% from Kohima, Mokokchung and Whokha were salaried employees. Household heads from Kohima, Mokokchung and Wokha were involved in up to six other primary activities compared to Phek where household heads were only involved in up to three activities.

3.1.1 Land ownership and use

There were difficulties in stating accurate estimates for the amount of land that households owned or cultivated. The acreage was estimated using the number of tins of rice that could be sown on a piece of land and from key informants, a tin of rice could be sown on 1 acre of land.. From this estimation, households owned on average of 11 acres of land as shown in Table 7. Households from Kohima and Mokokchung cultivated the highest and lowest amounts of land (4.1 and 2.0 acres) during the wet season. During the dry season, the households from Wokha cultivated 0.76 acres in comparison with 0.17 acres in Phek. While the majority of the households from Phek were engaged in crop farming as their primary activity, these households cultivated the smallest proportions of land in comparison to the total share of land owned in both the rainy and dry season. Overall the area cultivated during the dry season was 87 percent lower than during the wet season.

Table 7: Total land owned and cultivated by households across districts

District	Statistics	Total land owned (acres)	Total land cultivated during wet season (acres)	Total land cultivated during dry season (acres)
Kohima (n=53)	Mean	13.85	4.14	0.38
	Std. Deviation	17.90	8.13	2.75
Mokokchung (n=57)	Mean	7.84	2.04	0.28
	Std. Deviation	14.07	1.87	1.09
Phek (n=44)	Mean	9.30	2.13	0.17
	Std. Deviation	4.53	.95	.34
Wokha (n=38)	Mean	14.05	3.51	0.76
	Std. Deviation	24.18	4.33	.94
Total (n=192)	Mean	11.06	2.93	0.38
	Std. Deviation	16.46	4.87	1.63

Source: Survey Data

All the interviewed households owned the houses they lived in, which on average had 4 rooms and were constructed with iron sheets roofing material (92%) as shown in Table 8. In Kohima district 17% used thatch grass/palm while concrete was only used by 1% of the households. The main wall material for the main house was bamboo (43%), and bamboo with cement (29%). Stone walls were only found in the households from Mokokchung (1.8%).

Table 8: Type of housing

District	Bamboo	Bamboo with mud/cement	Timber	Brick plastered with cement	Stone
Kohima	30.2	34.0	24.5	11.3	-
Mokokchung	64.9	3.5	28.1	1.8	1.8
Phek	43.2	52.3	4.5	-	-
Wokha	28.9	34.2	28.9	7.9	-
Total	43.2	29.2	21.9	5.2	.5

Source: Survey data

The households from Phek neither used brick plastered with cement nor stone material. These construction materials were more sustainable and weather proof however, they were also more expensive and unaffordable for most households.

3.1.2 Asset ownership

The broad categories of the assets owned included communication, household and transport assets. The most commonly owned asset was a phone although only 20% of the total households owned one. Fifteen percent of the households owned a television and 12 % owned a gas cylinder. Other common assets were a radio, owned by 10% of the households and a sewing machine owned by 10% and a water tank owned by 9% of the households. These assets and the percentage of households owning them are given in Table 9.

Table 9: Percentage of households that own different assets

Asset	Kohima	Mokokchung	Phek	Wokha	Total
House plot in town	2.5	2.4		2.8	2.2
Phone (land/cell)	23.3	15.4	32.2	22.0	20.3
Television	20.0	14.2	13.6	12.8	15.2
Radio	9.2	7.1	16.9	13.8	10.0
Music system	10.0	5.1	11.9	12.8	8.5
Water tank	3.3	11.1	5.1	14.7	9.4
Gas cylinder	10.0	18.2	3.4	4.6	12.0
Refrigerator	3.3	7.5	-		4.3
Sewing machine	5.8	12.3	10.2	8.3	9.8
Washing machine	0.8	1.2	1.7		.9
Plough/harrow			-	4.6	.9
Motor cycle	2.5	3.6	1.7	2.8	3.0
Cart (thela)	2.5	.4	3.4		1.1
Car	5.0	1.2	-	0.9	1.8
Bus/trucks	1.7	.4	-		.6

Households from Phek owned the highest proportion communication assets 32.2% of the households in the district owning phones Households from Mokokchung had the highest number of other household assets including sewing machines owned by 12% of the households and gas cylinder owned by 18% of the households. Kohima had the highest proportion of households who owned transport assets at 12%.

3.1.3 Asset Ownership by Women

The main assets owned by women were baskets, necklace and sewing machines among others (Table 10). There was a large variation in women's ownership of assets with the highest percentage of women in Phek (52.4%) who owned baskets while 80.6% in Mokokchung owned a sewing machines and 15.6% in Wokha owned ornaments. An almost equal share from Kohima (24%) owned necklaces and the Mekhala traditional dress.

Table 10: Asset ownership by women

Asset	Kohima	Mokokchung	Phek	Wokha	Total
Basket	30.8	-	52.4	7.8	28.7
Necklace	24.8	9.7	7.1	-	12.8
Sewing Machine	4.3	80.6	-	6.3	11.5
Mekhala Traditional	23.9	-	-	-	9.5
Wooden box	-	-	25.0	-	7.1
Traditional Dress	8.5	9.7	-	10.9	6.8
Ornaments	-	-	1.2	15.6	3.7
Trunk	-	-	13.1	-	3.7
Radio	-	-	-	10.9	2.4
Phone	-	-	-	9.4	2.0

Source: Survey data

3.1.4 Livestock ownership

Most of the households interviewed kept small livestock including pigs and chicken (Table 11).

Table 11: Percentage of households that kept different livestock

District	Poultry	Pigs	Dogs	Cattle	Cats	Mithun	Goats	Buffaloes
Kohima	44.6	27.7	16.8	7.9	-	1.0	-	2.0
Mokokchung	37.6	47.9	9.4	0.9	3.4	-	0.9	-
Phek	54.2	31.9	8.3	-	-	4.2	1.4	-
Wokha	39.7	34.6	23.1	-	1.3	-	1.3	-
Total	43.2	36.4	14.1	2.4	1.4	1.1	.8	.5

Source: Survey data

Compared to poultry and pigs which were owned by 43% and 36% of the households respectively, cattle and goats were owned by only 2% and 0.8% of the respondents. Pigs were common in Mokokchung (48%) while poultry were dominant in Phek district (54%). On average households owned 2 pigs and 13 chickens. For those households that owned cattle, the average number kept was 7 cattle (Table 12).

Table 12: Mean number of livestock owned by households

Livestock	Statistic	Kohima	Mokokchung	Phek	Wokha	Total
Pigs	Mean	1.79	2.64	2.87	1.81	2.34
	N	28	56	23	27	134
	Std. Deviation	2.08	1.38	2.55	1.36	1.82
Cattle	Mean	7.25	5.00	0	0	7.00
	N	8	1	0	0	9
	Std. Deviation	7.46	0	0	0	7.02
Goats	Mean	0	3.00	2.00	3.00	2.67
	N	0	1	1	1	3
	Std. Deviation	0	0	0	0	.58
Dogs	Mean	1.35	1.55	2.17	1.17	1.42
	N	17	11	6	18	52
	Std. Deviation	.61	.82	2.04	.38	.89
Poultry	Mean	22.78	11.98	10.97	6.61	13.74
	N	45	44	39	31	159
	Std. Deviation	20.97	6.16	8.70	4.44	13.81

Source: Survey data

Only households in Kohima and one household in Molkchung kept cattle. Dogs were common across the districts and households kept on average 1 dog.

3.1.5 Livestock ownership by women

The ownership of small livestock characteristic of the sample is mirrored in the ownership of livestock by women. Women mainly owned poultry and pigs (Figure 2). In 73.3% of the households in Kohima, women owned poultry while in 75% of the households in Mokokchung, women owned pigs. In Kohima, women owned poultry, pigs, dogs and cattle although they were more likely to own poultry and pigs than dogs and cattle. In Wokha, women owned poultry, pigs, dogs, ducks and goats. Only a very small percentage however owned dogs, goats and ducks. In Mokokchung, women only owned poultry and pigs.

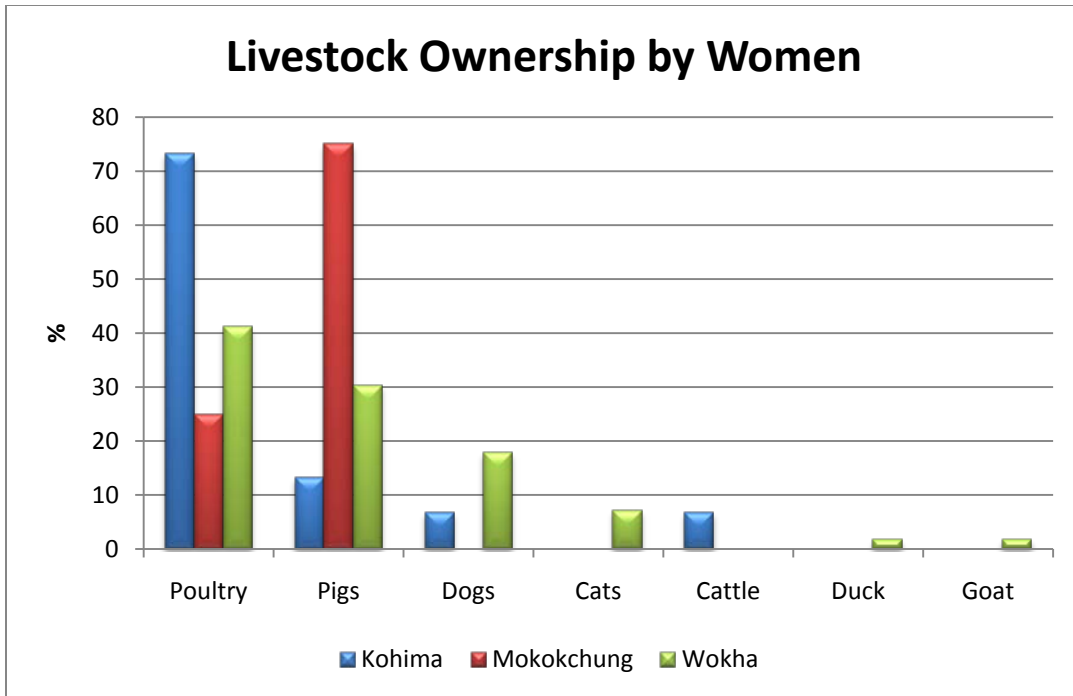


Figure 2: Livestock ownership by women

3.2 Access to and use of services

3.2.1 Access to extension and training services

Access to services was generally low across all the selected villages.

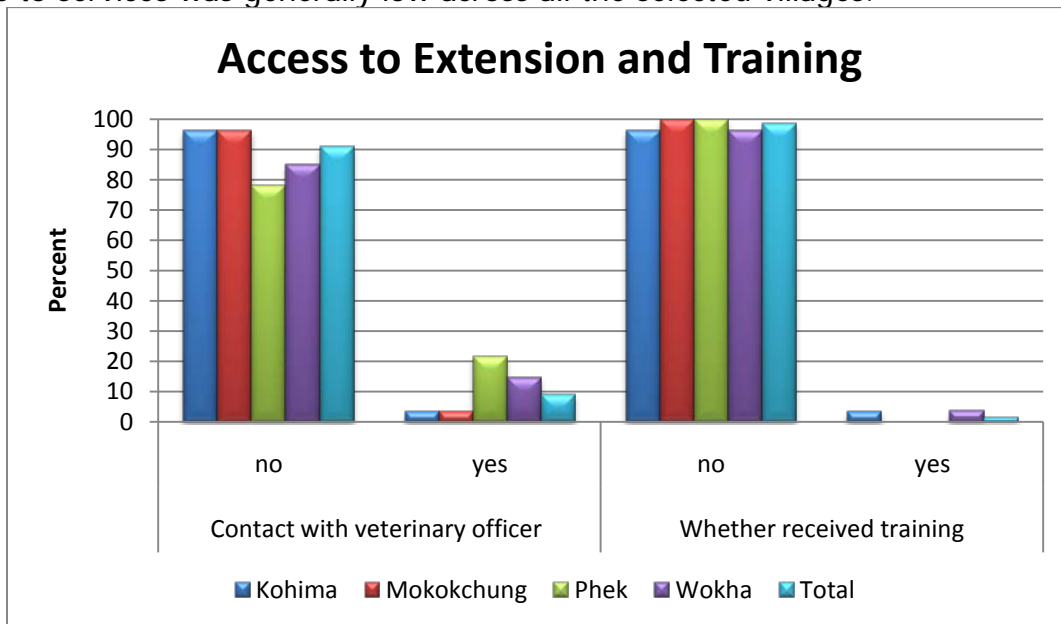


Figure 3: Contact with Veterinary officer about pigs and training

Only 9% of all pig owning households had contacted the veterinary officers about pigs in the 12 months prior to the survey, while only 1.5% received training on pig production and management (Figure 3). Although the respondents from Mokokchung owned the highest number of pigs in the sample, they had the lowest contact with veterinary officers, with only 3% of them having contacted a veterinary office in the 12 months prior to the survey. Pig owners from Phek on the other hand had the highest contact with veterinary officers at 22%.

3.2.2 Credit

Overall 31% of all households borrowed money the 12 months prior to the survey. Sixty three percent of households from Wokha and 40% from Kohima borrowed money while no household from Phek borrowed money in the same period. In Mokokchung 26% of the households borrowed money. Of those that borrowed money in Mokochung, 60% borrowed from formal lending institutions (60%) while 20% obtained their loans from NEPED. In Kohima, 68% of the households obtained money from local money lenders while 22% obtained loans from banks and NGOs. Across the whole sample, family and friends accounted for a significant proportion of the source of loans with 32% of households indicating they got their loans from family and friends.

Overall, the most common use of loans was payment of school fees (29%), followed by purchase of livestock (19%), health (17%) and housing (16%) (Table 13). There was variation across districts with livestock being the priority expenditure for Kohima, school expenses in both Mokochung and Wokha.

Table 13: Purpose for which loan was obtained

Purpose	Kohima	Mokokchung	Wokha	Total
Pay school expenses	14.3	40	34.6	29
Buy livestock	42.9	6.7	7.7	19.4
Health (human)	19.0	13.3	19.2	17.7
Housing	14.3	6.7	23.1	16.1
Buy farm inputs	9.5	20.0	3.8	9.7
Others (marriage, death, business)	-	13.4	11.5	8

Source: Survey data

3.2.3 Insurance

Twenty four percent of all households had taken insurance in the one year prior to the survey. From Figure 4, the highest proportion of the respondents who had obtained insurance were from Kohima (57%) and the least number of respondents were from Phek (2%)

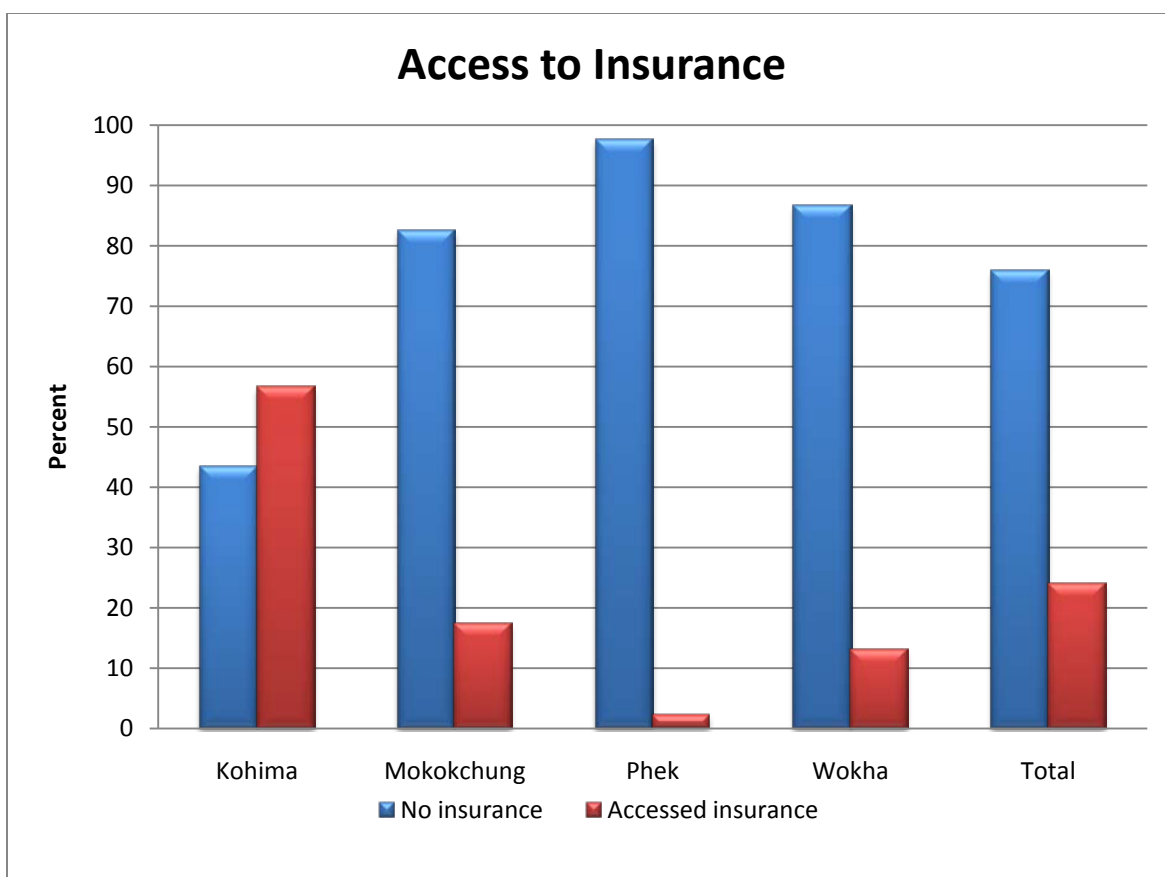


Figure 4: Access to Insurance in the last 12 months

The main insurance taken by households was health/life and vehicle. Health/life insurance was used by 93% of the all households that obtained insurance (Table 14). In Kohima and Mokokchung, 6% and 10% of the households also had vehicle insurance respectively. The main source of insurance was from NGOs (59%) followed by private companies (33%). Government insurance sources accounted for 11% of the total insurance.

Table 14: Types and sources of insurance

Type and source	Kohima	Mokokchung	Phek	Wokha	Total
Type of Insurance (%)					
Health/life	93.3	90.0	100.0	100.0	93.5
Vehicle	6.7	10.0	0	0	6.5
Source of Insurance (%)					
Government	0	10.0	100.0	40.0	8.7
NGO	90.0	0	0	0	58.7
Private company	10.0	90.0	0	60.0	32.6

Source Survey data

In Kohima, 90% of the insurance was provided by NGOs with 10% being provided by private companies. This was in contrast to Mokokchung where 90% of the insurance was from private companies and 10% from the government. The main source of insurance in Phek was the government, providing 100% of the insurance to households. In Wokha, there was a better balance with 40% of the insurance being provided by the government and the other 60% by private companies.

3.3 Livelihood strategies

There were some differences in the importance of different livelihood strategies between pig owning and non-pig owning households as shown in Figure 5.

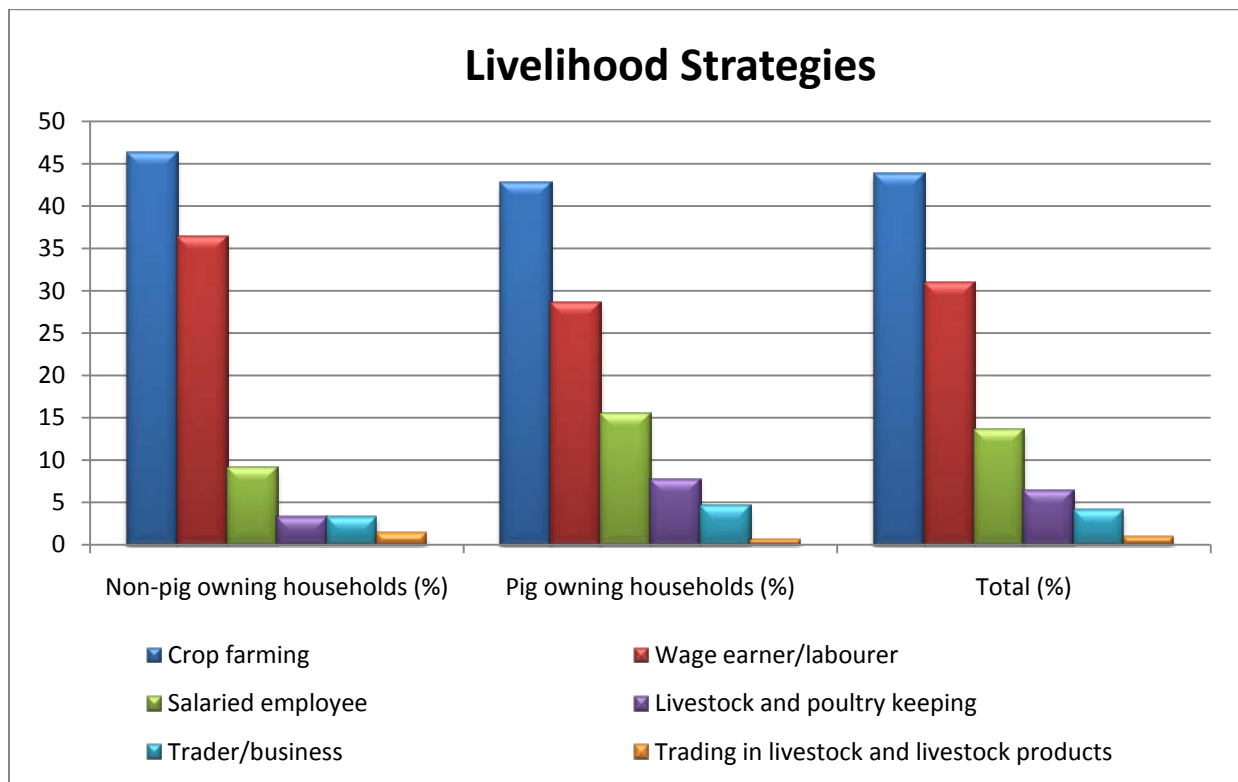


Figure 5: Livelihood strategies for pig owning and non-pig owning households

In the overall sample, 44% and 31% of the respondents derived their livelihoods from crop farming and wage earnings respectively. There were more pig owning households that earned income from salaried employment and that were earning wages. There were also more pig owning households with other livestock and poultry and that were traders or business people. This showed that the pig owning households had more diversified livelihoods than the non pig owning households, hence subjecting them to less risk.

3.4 Food security

Twenty one percent of the households reported periods of food shortages. Phek district had the highest number of respondents that faced food shortages with 66% of households reporting food shortages. In Wokha and Kohima, 21% and 9% of households reported food shortages respectively, while none of the households in Mokokchung reported facing any food shortages. In Phek, the months of critical food shortages were January, February, November and December (Figure 6).

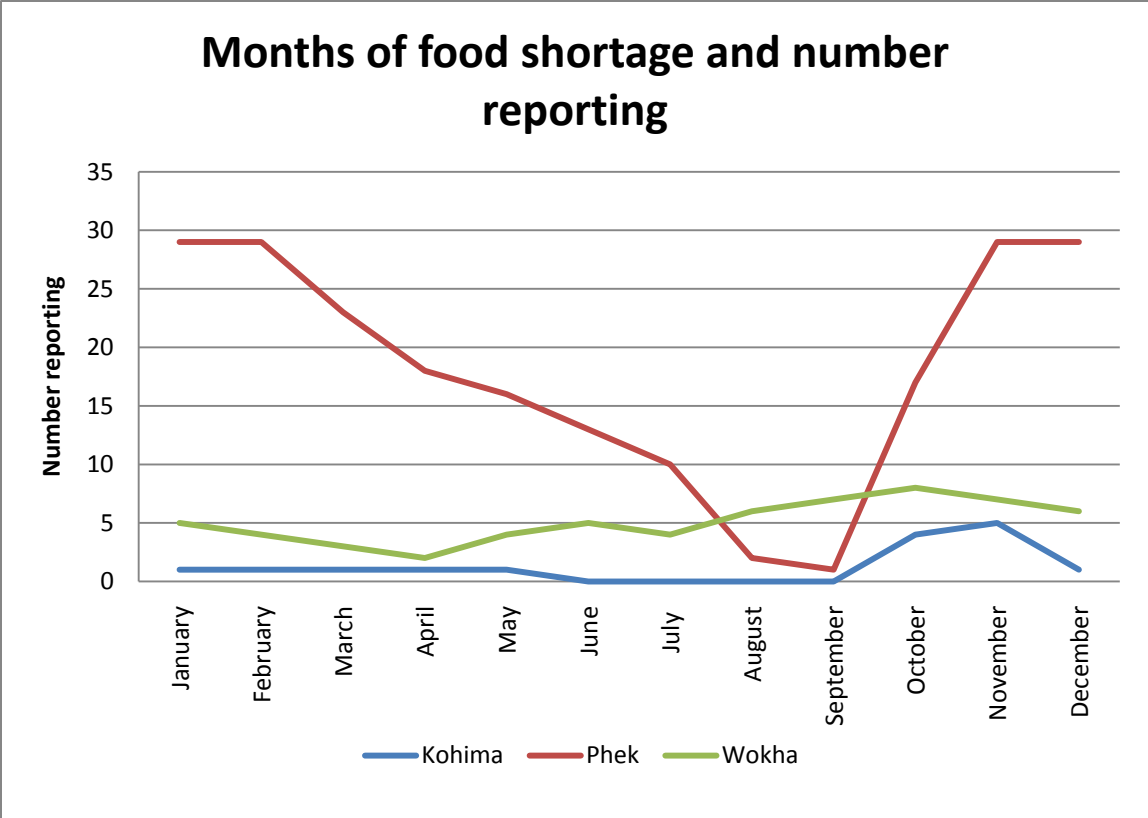


Figure 6: Months and frequency of food shortage

The lowest reported cases of food shortages were in August and September while the incidences of food shortages were on the downward trend in the remaining months in Phek.

4 Pig management, production and productivity

4.1 Pig Breeding

4.1.1 Breeding practices

Farmers kept different pig breeds. Fifty four percent of the households kept large black pig breed, 21% the indigenous/local breeds and 13% the cross breeds as shown in Table 15. By district, 84% of the households in Mokokchung district and 62% of the

households in Kohima district kept the large black breed. In contrast, only 23% of the households in Phek kept the large black, preferring to keep indigenous breeds (73%).

Table 15: Breeds of pigs kept by households

District	Indigenous (%)	Large black (%)	Hampshire (%)	White Yorkshire (%)	Burmese (%)	Cross (%)
Kohima	9.4	62.5	9.4		12.5	6.3
Mokokchung	0	83.9	1.8	1.8	12.5	0
Phek	73.1	23.1	0	0	0	3.8
Wokha	29.6	11.1	0	0	0	59.3
Total	21.3	53.9	2.8	.7	7.8	13.5

Source: Survey data

Households in Phek and Wokha did not own Hampshire, Yorkshire and Burmese breeds while the households from Kohima had five breeds, followed by Mokokchung with four types of breeds. The diversity of breeds and ownership of exotic breeds has potential implications for the improvement in productivity interventions for the project. The exotic breeds were preferred because of their rapid growth rate (32%), easy feeding (24%), and high littering ability (15%) as shown in Table 16.

Table 16: Reasons for preferring exotic pig breeds

Reason	Kohima (%)	Mokokchung (%)	Phek (%)	Wokha (%)	Total
Fast growth rate	42.9	36.6	25.4	25.7	32.6
Easy feeding	26.2	30.1	11.9	21.6	23.8
High number of piglets	0.0	18.7	16.9	17.6	15.4
Ready market	21.4	1.6	35.6	14.9	14.4
More suitable for cultural reasons	2.4	4.1	6.8	16.2	7.4
Not labor intensive	2.4	8.9	1.7	0.0	4.4
Bring more income	0.0	0.0	1.7	2.7	1.0
Big in size	4.8	0.0	0.0	0.0	0.7
Can't afford other breeds	0.0	0.0	0.0	1.4	0.3

Source: Survey data

Thirty seven percent of the entire sample practised controlled mating (Figure 7). Controlled mating is a practice whereby the farmer decides the male boar to be used for mating.

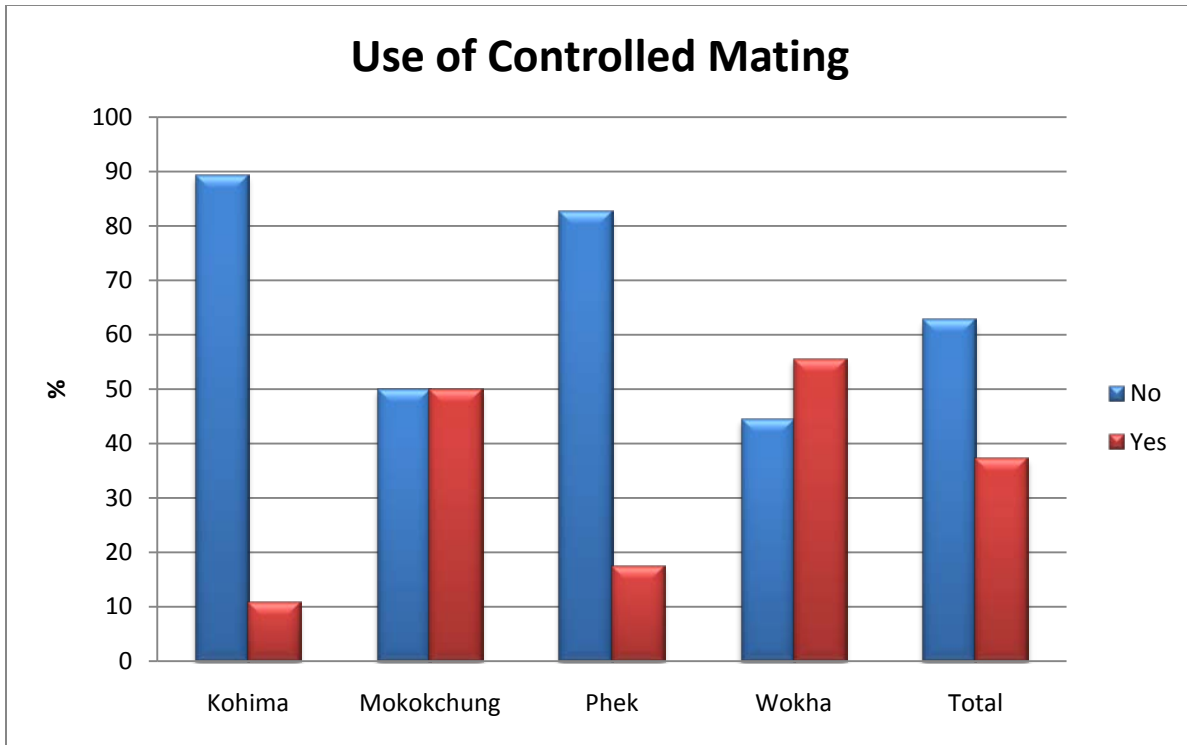


Figure 7: Use of controlled mating

Controlled mating was mainly practised to ensure reduction in piglet mortality (40%), and increase in piglet production (38%) as shown in Figure 8.

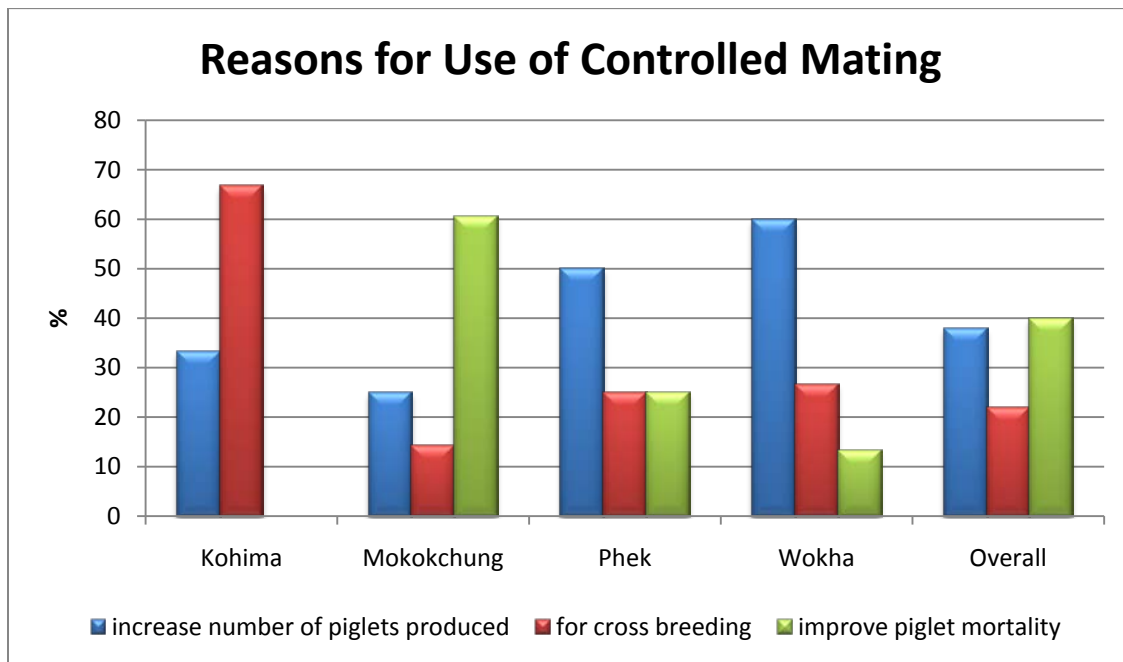


Figure 8: Reasons for use of controlled mating

In Kohima, the main reason for controlled mating was for cross breeding while in both Phek and Wokha, the main reason for controlled mating was to increase the number of piglets produced. In Mokokchung, the main reason for controlled mating was to improve piglet mortality.

Eighty percent of the households hired the boar for mating while only 14% used a boar from their own herd (Figure 9). Respondents from Kohima and Wokha obtained the boar from all three sources – their own herd, on loan or hired it, while respondents from Mokokchung and Phek either used a boar from their own herd or hired the breeding male. The reasons given by the respondents for using a hired boar were cross-breeding purposes and lack of own boar. Of the households that used a boar that belonged to them, 58% reported that they have never used a boar that was not from their own herd, 6% had used a boar not from their herd 5 to 10 years ago, while 4% indicated that they had used a boar not from their own herd more than ten years ago.

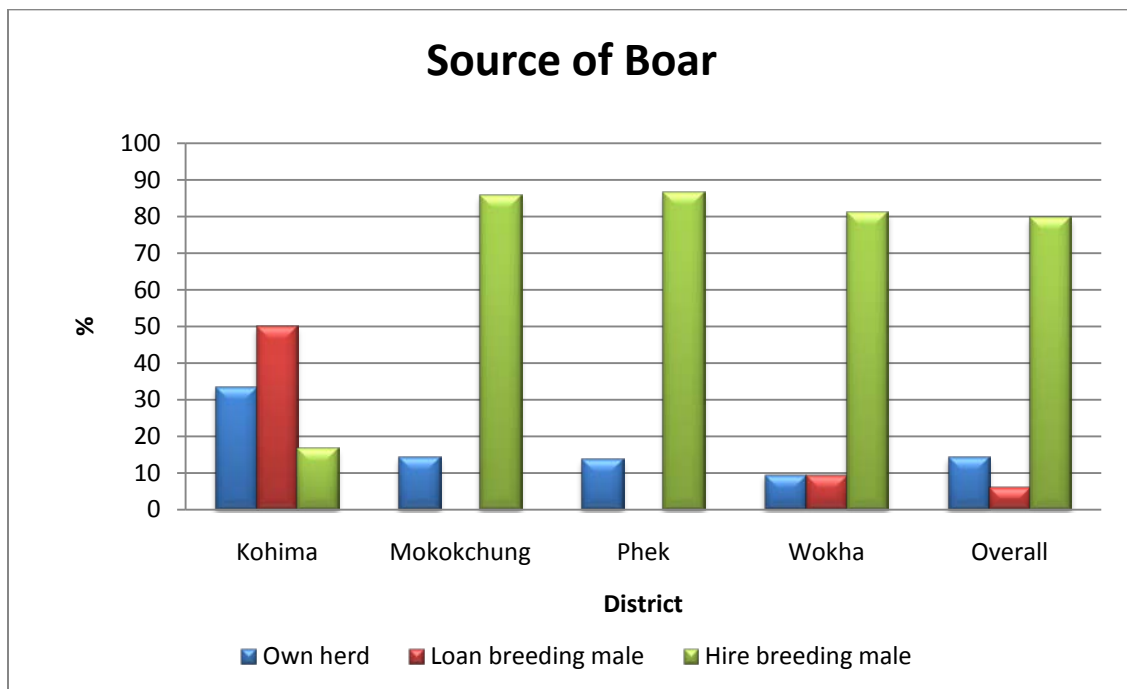


Figure 9. Source of Boar

Various reasons were cited for the households that used their own boar. Of the total sample, 32% of the households particularly Wokha (56%) and Mokokchung (40%) considered it problematic to mate their sows with a boar that does not belong to them due to high disease risk. High expense was a reason given by 26% of the sample while, difficulty in transporting the males was cited especially by households in Kohima (13%).

4.1.2 Breeding Constraints

Lack of knowledge on aspects such as breeding practices, the best breeds/cross breeds to use and how to identify the best breeds from farmers own herds were given as constraints to breeding as shown in Figure 10.

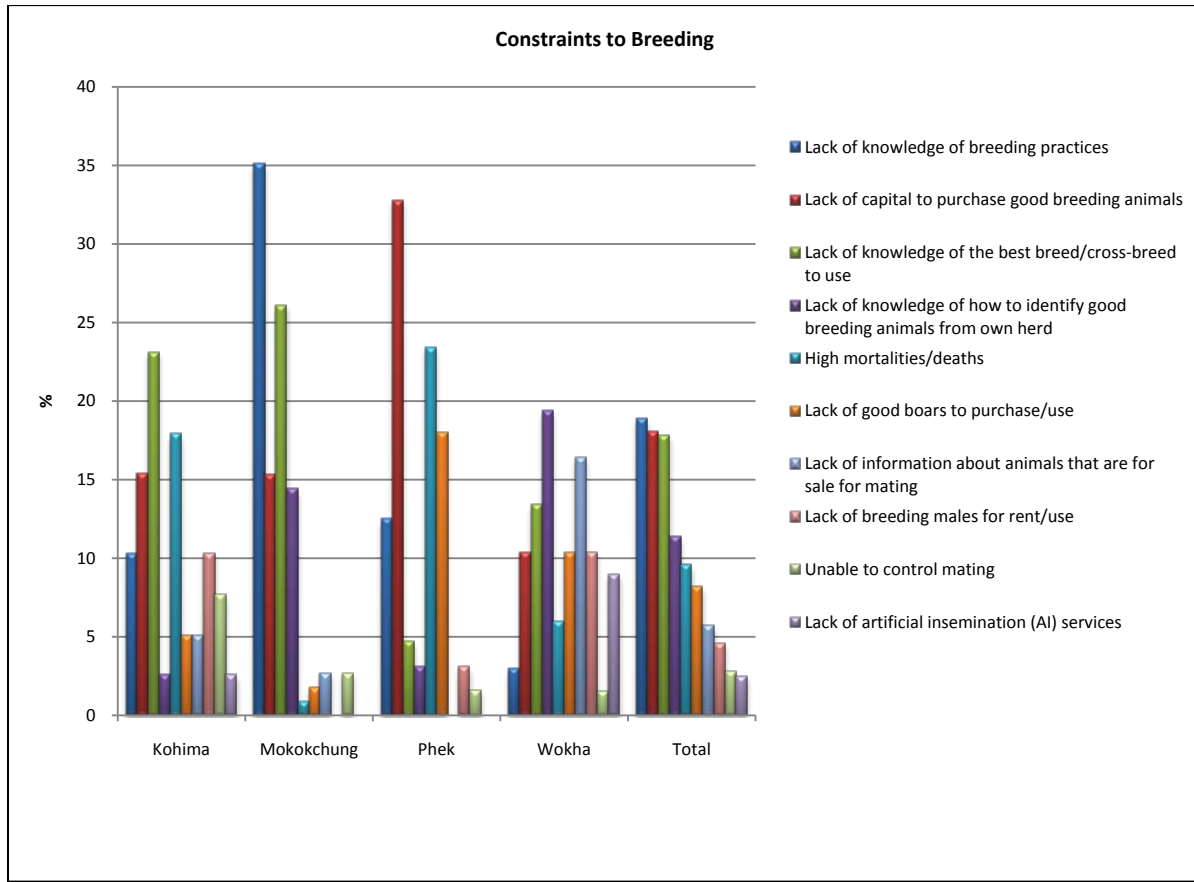


Figure 10: Constraints to pig breeding

In Kohima, the 3 top most constraints to breeding were lack of knowledge on the best breed of animals to use for breeding, high mortality rates and lack of capital to purchase good breeding animals. In Mokokchung, lack of knowledge of breeding practices, lack of knowledge on best breeds and lack of capital were the top constraints. In Phek, the main constraint was lack of capital to purchase good breeding animals and high mortalities. Lack of knowledge on how to identify a good animal from the herd was given as a constraint by most respondents from Wokha followed by lack of information about animals that are for sale for mating.

4.2 Feeds

4.2.1 Common feeding practices

The main feeding practice was sty feeding (89%) while only 9% of the households used the free range feeding system. Sty feeding was practised by all households from Kohima, 98% of the households in Mokochung and 89% from Wokha. Forty eight of the households in Phek used the free range feeding system (Figure 11).

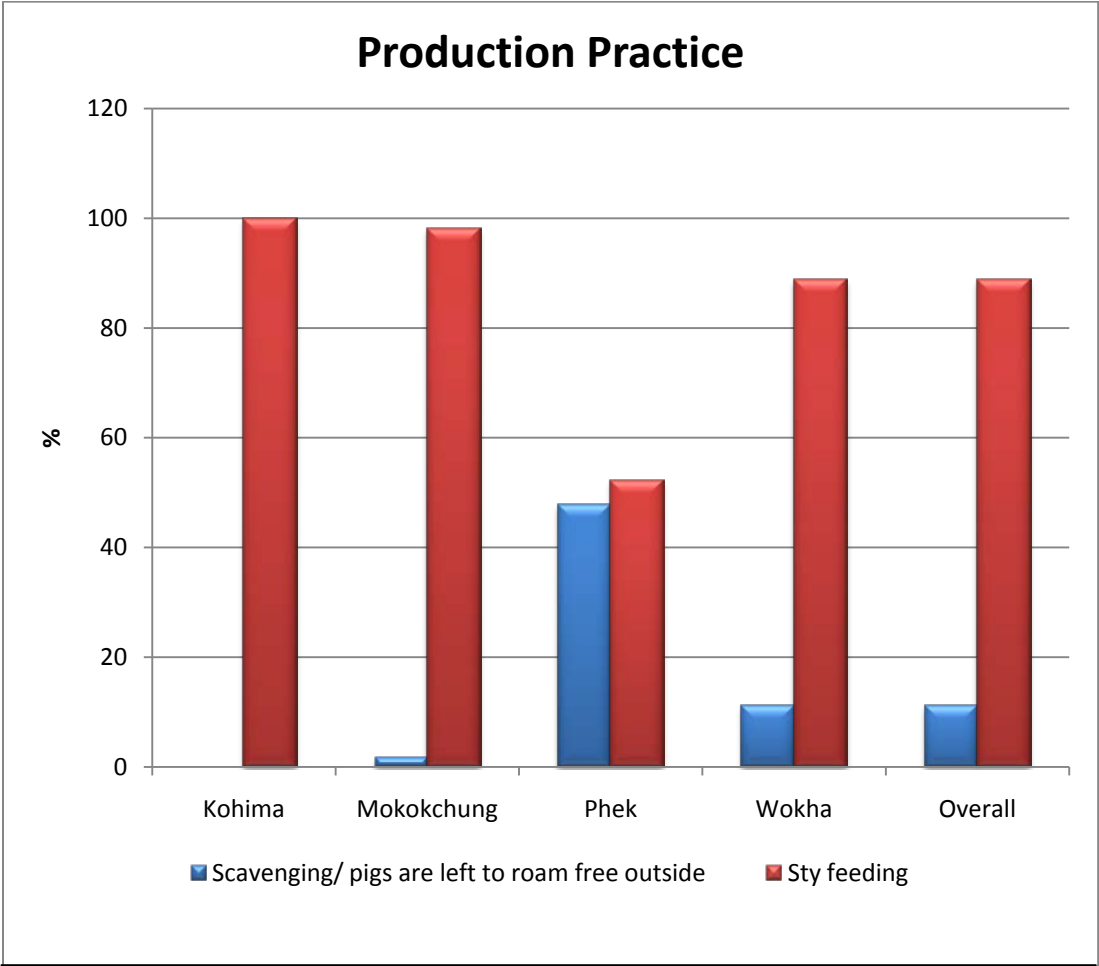


Figure 11: Type of production practice

Fodder and gains were the main feed types used in both dry and wet seasons. During the dry season however, 34.2% of the respondents from Mokochung reported that they use commercial feeds while in the wet season, 30% of the households in Kohima 33% of the households in Mokochung used commercial feeds (Table 17).

Table 17: Common feed types and sources

Dry season	Kohima (%)	Mokokchung (%)	Phek (%)	Wokha (%)	Total
Fodder/leafy materials	35.9	36.8	38.3	36.5	36.8
Grains	35.9	28.9	38.3	36.5	33.5
Commercial feeds	26.9	34.2	23.3	27.0	29.4
Silage	1.3%				.3
Wet season	Kohima (%)	Mokokchung (%)	Phek (%)	Wokha (%)	Total
Fodder/leafy materials	33.7	36.8	38.3	36.0	36.2
Grains	33.7	29.6	38.3	36.0	33.2
Commercial feeds	30.1	33.6	23.3	28.0	30.0
Silage	2.4				.5

Overall, the most common source of feed was purchase followed by collection of feed in the wild (Figure 12). In Kohima, the most common source of feed was own farms during both the dry and wet season. In Mokokchung and Wokha, the feed was either purchased or collected from the wild. In Phek, the main source of feed during the wet season was own farms while during the dry season, most of the households purchased feed for the pigs.

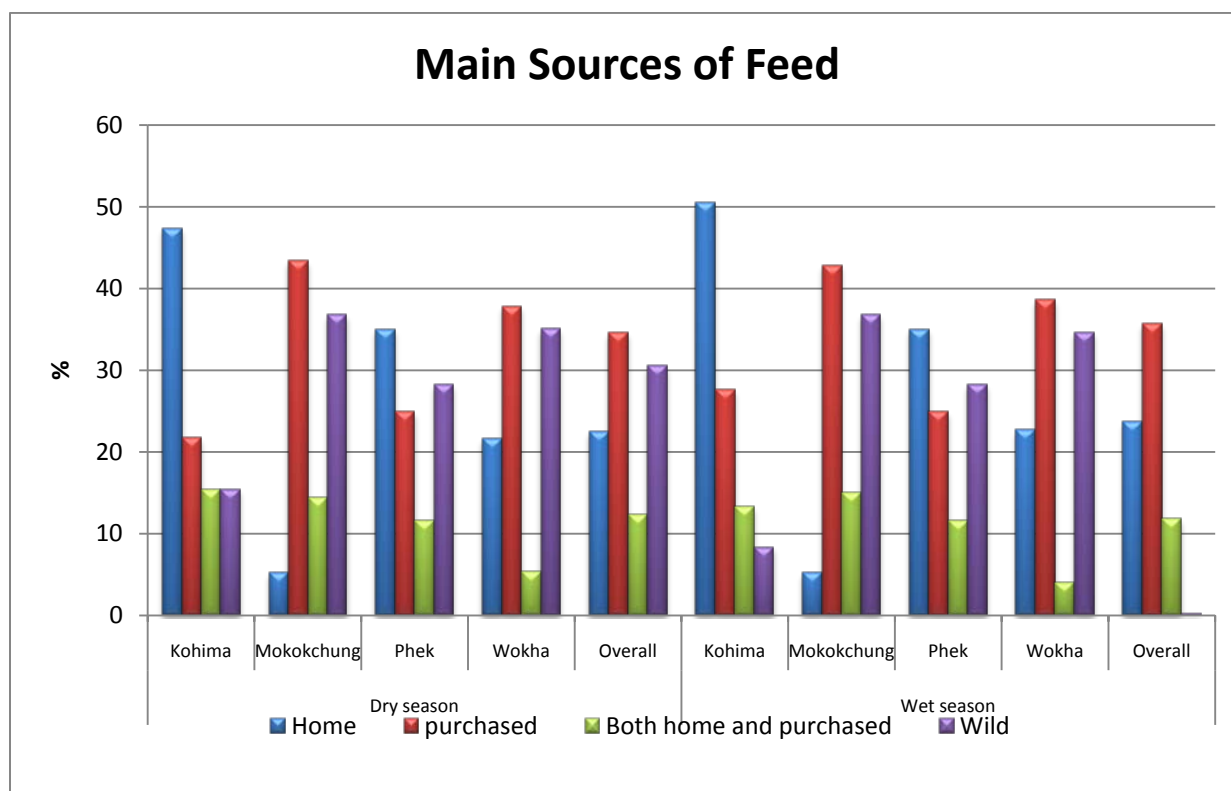


Figure 12: Main sources of feed

Some of the households experienced acute feeds shortage in the 12 months prior to the survey particularly those in Phek and Wokha districts where 69% and 63% of households respectively experienced feed shortages. Feed shortages were experienced by less than 50% of the households in Kohima and 25% in Mokokchung districts. During times of feed shortage, households shared human food with the animals (27%) while others resorted to selling (17%) and slaughtering the animals (22%) as shown in Table 18.

Table 18: Action taken during feed shortages

Action taken	Kohima (%)	Mokokchung (%)	Phek (%)	Wokha (%)	Total (%)
Share human food with animals	31.6	12.2	46.9	21.9	26.6
Slaughter animals	26.3	26.8	3.1	31.3	21.8
Sell animals	21.1	14.6	3.1	31.3	16.9
Prioritize feeding of the best animals	5.3	19.5	3.1	15.6	12.1
Purchase of grains	5.3	.0	40.6	.0	11.3
Give away animals	5.3	17.1	.0	.0	6.5
Loan out animals/ traditional system	5.3	9.8	3.1	.0	4.8

Source: Survey data

In Kohima, the most common strategies for dealing with feed shortages were sharing of human food with pigs (31.6%), slaughtering (26.3) and sale of the pigs (21.1%). In contrast, the most common strategies in Mokokchung were slaughtering, prioritizing feeding for some animals and giving away the pigs. In phek, the two common strategies were sharing of human food and pigs and purchase of grains.

4.2.2 Constraints to Pig Feeding

The main constraints to pig feeding were predominantly four as shown in Figure 13. These were; high costs of feeds, time requirement to collect feeds, lack of fuel wood to cook the feed and difficulty in transportation. These constraints all related to the time and expenses incurred in feeding the animals and no mention of the lack of knowledge on the feeding practices.

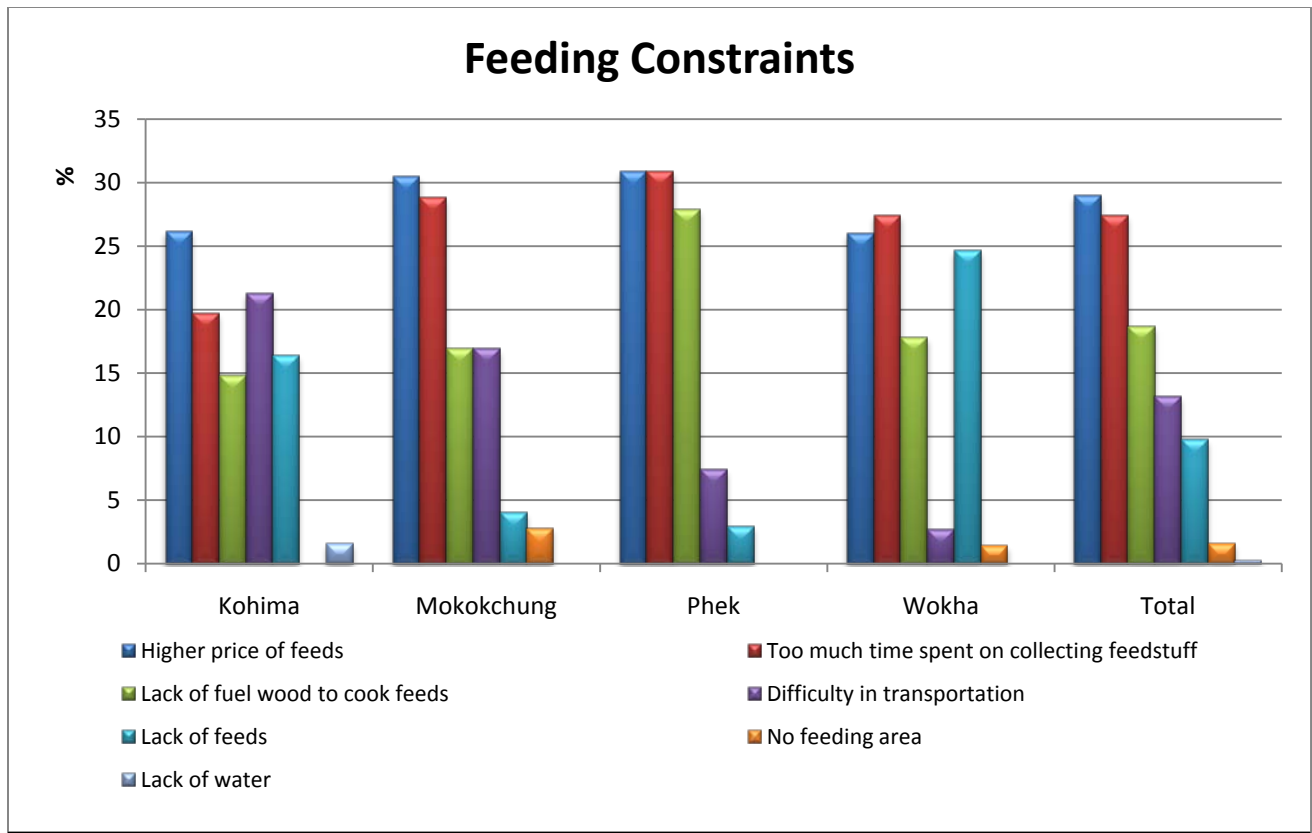


Figure 13: Feeding constraints

4.3 Housing

The majority of the households in the sample housed their pigs all the time (Figure 14). Only 15% of the households in the overall sample housed the pigs at night only while 10% did not house their pigs at all. Ninety one percent of the respondents in Mokokchung housed the pigs all the time; by contrast however, 52% of households in Phek housed the pigs all the time. Ninety three percent of the households used the roofed sty. All pigs in Mokokchung were housed in a roofed sty while in Wokha district, 12% of the households kept their pigs in an open sty. In Phek district, 6% of households kept the pigs in the living room while 91% of the households in Kohima kept pigs in roofed sty.

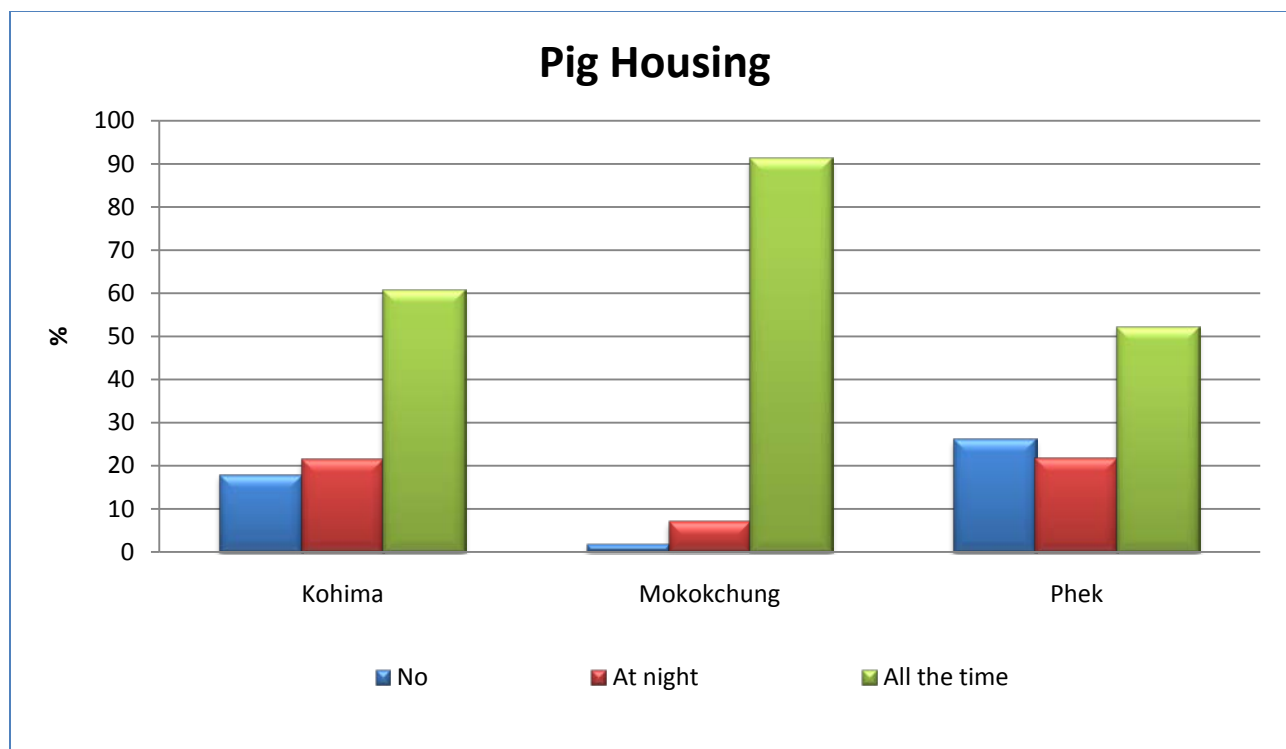


Figure 14: Frequency of pig housing

The mode of housing used during the wet and dry seasons was predominantly the roofed sty.

Table 19. Mode of Housing during the dry season and the wet season

Mode of Housing in the Dry season					
District	Open sty (%)	Roofed sty (%)	Brick walled and tin roofed sty (%)	In the house (%)	Plastic (%)
Kohima	0	91.3	8.7	0	0
Mokokchung	0	100	0	0	0
Phek	5.9	82.4	0	5.9	5.9
Wokha	11.5	88.5	0	0	0
Overall	3.3	93.4	1.7	0.8	.8
Mode of housing in the wet season					
District	Open sty (%)	Roofed sty (%)	Brick walled and tin roofed sty (%)	In the house (%)	
Kohima	0	91.3	8.7	0	
Mokokchung	0	98	2.0	0	
Phek	0	93.8	0	6.3	
Wokha	11.5	88.5	0	0	
Overall	2.6	94	2.6	0.9	

During the dry season, 5.9% of the respondents from Phek used plastic and housed the pig in the house while 5.9% of the households from Phek and 11.5% from Wokha used an open sty in the dry season. During the wet season, and 11.5% from Wokha used the open sty and 6.3% from Phek housed the pig in the house.

Piglets were prioritised animals for housing during the dry and wet seasons (32%), due to their vulnerability to adverse weather conditions and diseases (Table 20). Housing was also prioritized for weak animals (22%) and pregnant sows (14%).

Table 20: Animals prioritized for housing

Animal type	Kohima (%)	Mokokchung (%)	Phek (%)	Wokha (%)	Total (%)
Dry season					
Piglets	42.9	29.7	33.3	21.1	31.5
Weak animals	2.0	32.2	29.6	5.3	21.1
All	.0	22.0	.0	42.1	18.1
Pregnant sows	24.5	1.7	33.3	10.5	11.6
Lactating sow	2.0	11.9	.0	13.2	8.6
Breeding boars and adult males	28.6	2.5	3.7	7.9	9.1
Wet season					
Piglets	44.0	29.9	33.3	20.5	31.8
Weak animals	.0	29.0	29.6	5.1	18.4
All	.0	21.5	.0	41.0	17.5
Pregnant sows	26.0	3.7	33.3	12.8	13.9
Lactating sow	.0	13.1	.0	12.8	8.5
Breeding boars & Adult male	30.0	.0	.0	.0	9.9

Source: Survey data

Ninety five percent of the households had constructed a feeding trough/manger in the sty. The district analysis showed that all the households in Mokokchung, 89% in Kohima, 96% in Wokha and 91% Phek had a manger (Table 21).

Table 21. Households with a manger/ feeding trough in the sty

District	No (%)	Yes (%)
Kohima	10.7	89.3
Mokokchung	0	100
Phek	8.7	91.3
Wokha	3.7	96.3
Total	4.5	95.5

The type of manger was different across the households. In 58 of the households the manger was at the same level as the rest of the sty, while 36% reported that it was higher and 6% that it was lower than the sty.

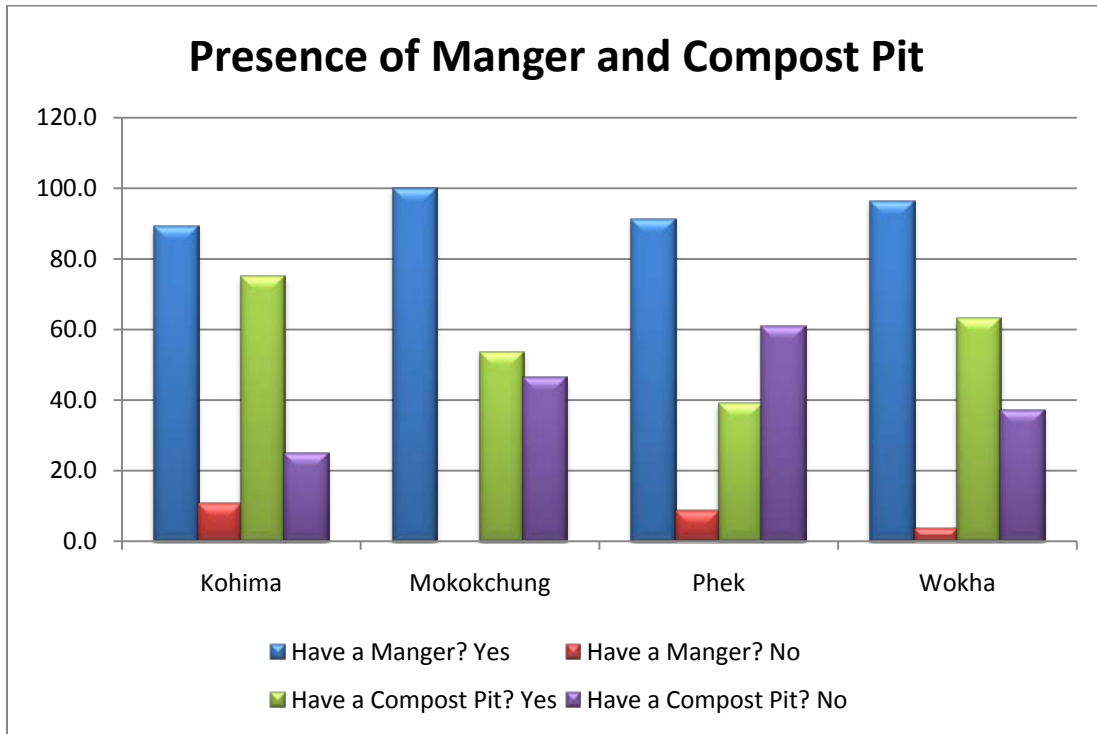


Figure 15: Presence of manger and compost pits

Overall, 58% of the households had a compost pit to which the waste from the sty was collected. The households in Kohima (75%), and Wokha (63%) reported that they owned a composite pit on their farm (Figure 15). The main use of the waste was manure for crops (94%), while 3% reported that the waste was given out to friends and neighbours. Eleven percent of the households in Wokha district sold manure at the farm gate to other farmers.

Households were asked to state their perceptions of various aspects of the pig production unit in relation to the homestead. Sixty percent of the households indicated that the area around the pig sty was not clean and would smell occasionally. Enumerator observed that in 70%, the area around the sty was not clean.

Eleven percent of the households reported that family members complained that the environment around the homesteads was smelly. Consequently 39% of all sampled households, 60% in Phek, 50% in Kohima, 30% in Wokha and 10% in Mokokchung reported that these problems posed a health risk to their families.

Table 22. Perceptions of various aspects of the pig production unit

District	Area around the pig sty is not clean and smells (% of households)	Left over feed from pigs in compound (% of households)	Environment causes health risk to the family (% of households)
Kohima	85.7	64.3	50
Mokokchung	37.5	28.3	10.7
Phek	52.2	66.7	60.0
Wokha	88.9	37.0	29.6
Total	60.4	44	29.4

4.4 Health Issues

4.4.1 Common diseases and their management

The most common diseases and parasites affecting pigs were worms and swine fever across all homesteads. Skin problems (lumps, rash and scabs), and fever were reported in three of four districts (Figure 16).

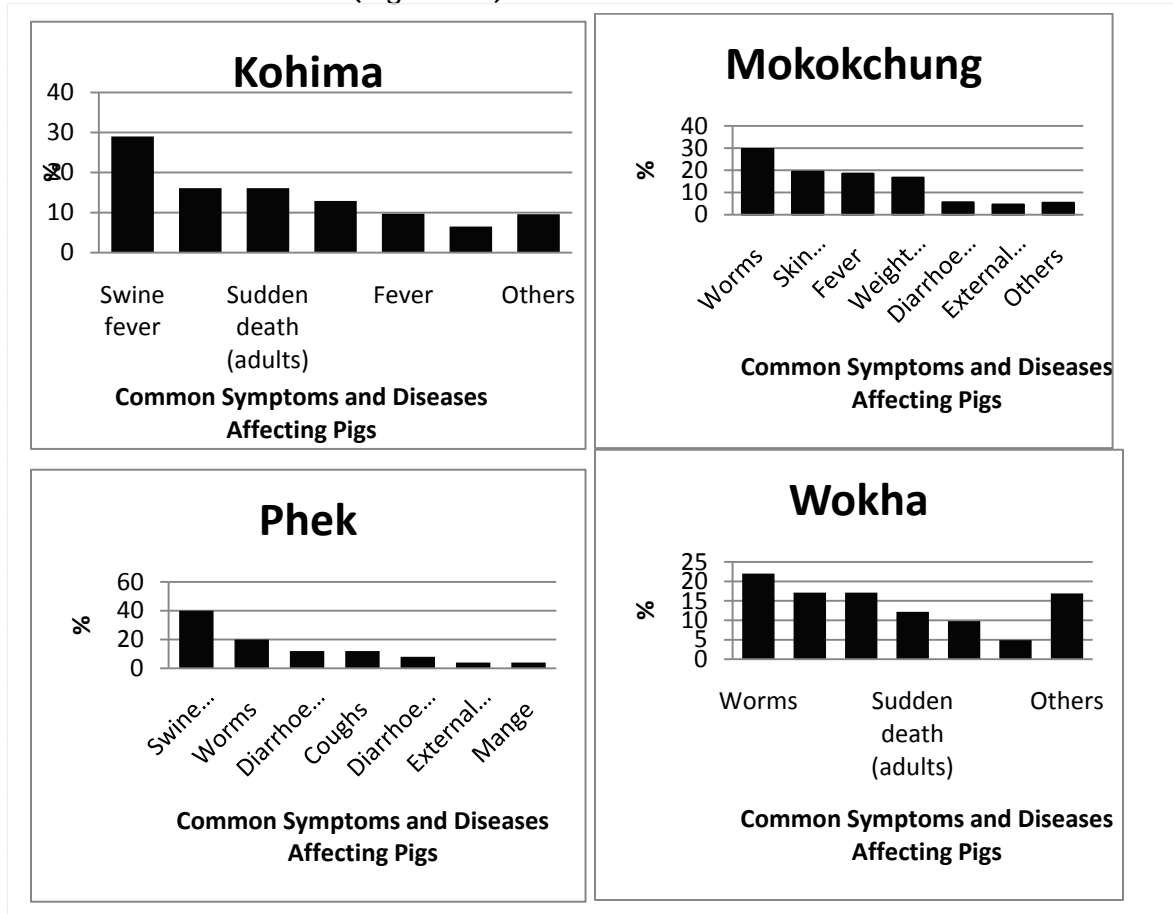


Figure 16: Common diseases/symptoms affecting pigs

Forty percent of the households in Phek and 29% in Kohima reported swine fever while worms were common in Mokokchung (30%), followed by Wokha (22%). Most of these diseases and symptoms occurred on average once per year except for symptoms such as coughs and fever that occurred at least twice during the year. Most of the diseases and symptoms are treated using the traditional medicine (37%), followed by conventional medicine (29%) or no treatment at all (18%) as presented in Figure 16.

The main diseases treated through conventional medicine included; parasites, fever and worms while foot and mouth, swine fever and wounds were mainly treated through traditional methods. Overall, 50% of the households using conventional medicine purchased drugs for treatment of diseases, while the analysis by district shows that 63%, 57%, 36% and 12% of Mokokchung, Wokha, Kohima and Phek households purchased drugs respectively. The drugs were mainly purchased from both government veterinary officers (21%) and in the local drug stores (21%). Other drug outlets included private veterinary officers and farmer organizations.

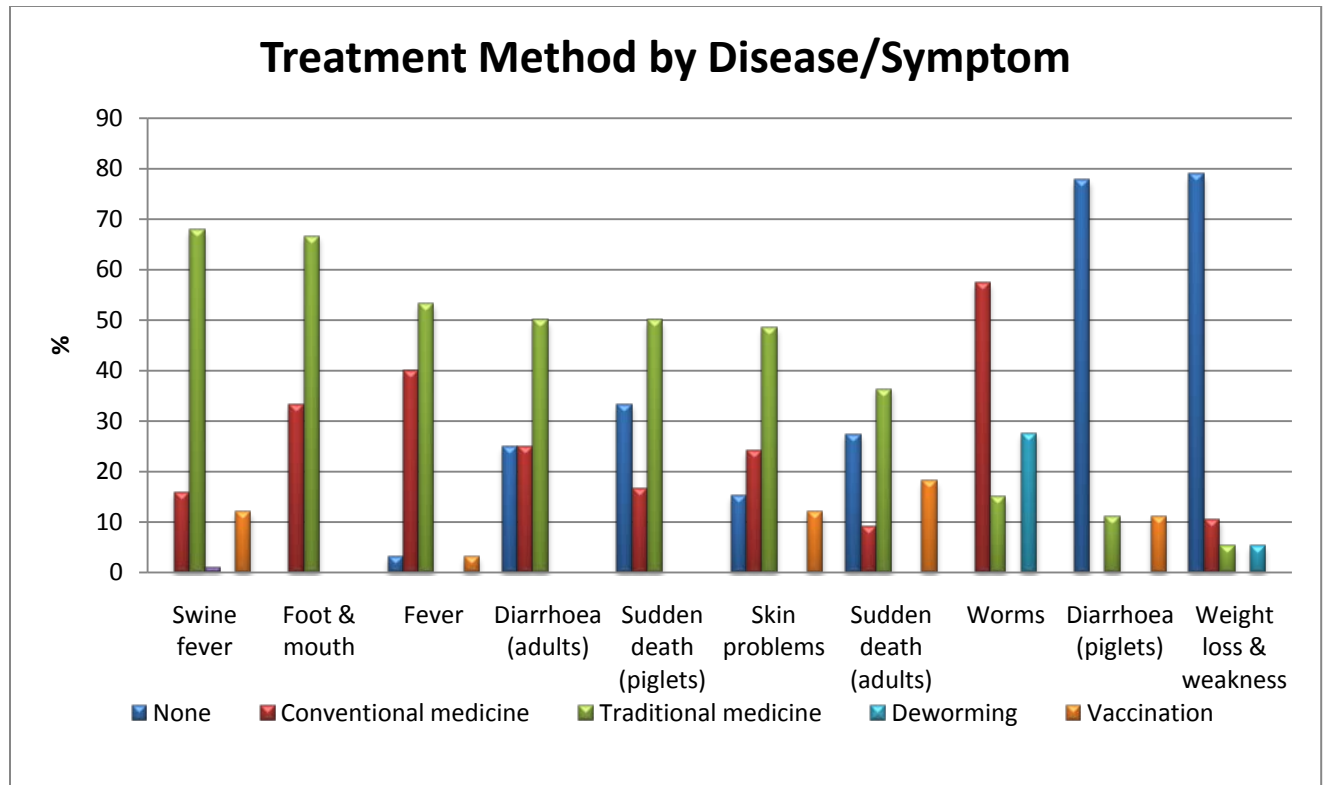


Figure 17: Treatment methods for common diseases and symptoms

4.4.2 Constraint to disease management

The main constraints to disease management were lack of veterinary services (48.1%), inability to correctly diagnose disease (22%) and unaffordability of veterinary services (14%). These are shown in Figure 18.

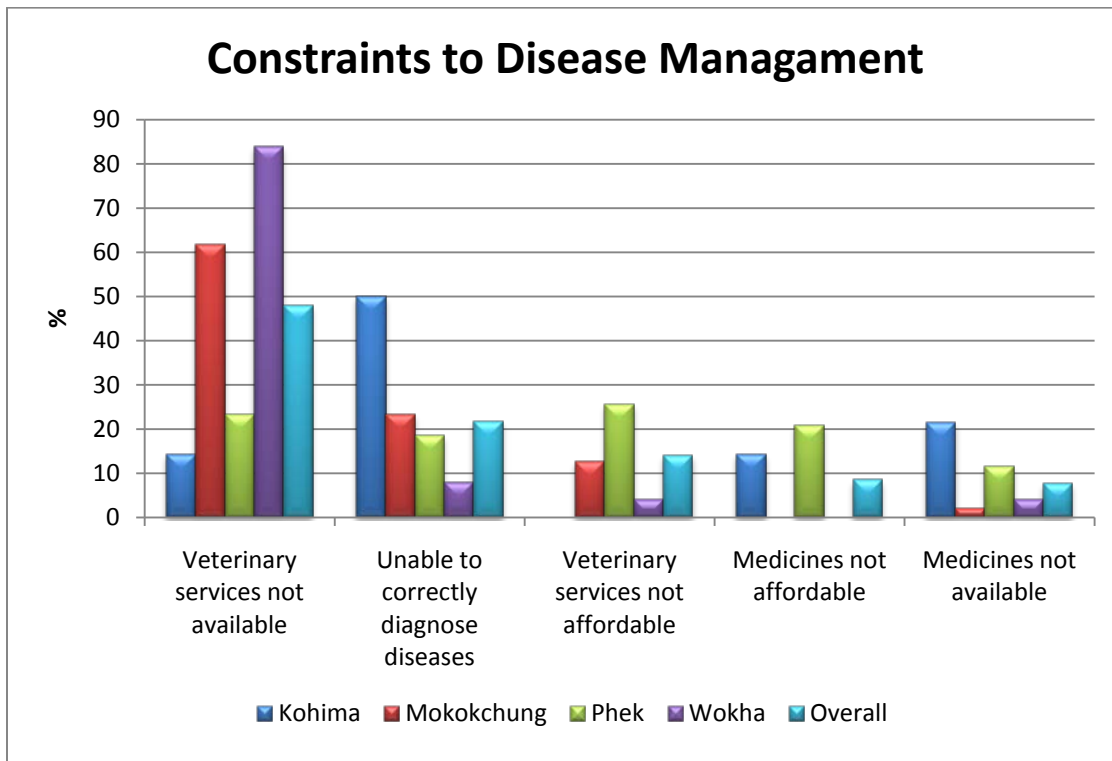


Figure 18: Constraints to disease management

These results are in line with earlier results showing that only 9% of households had contacted the veterinary officer while only 1.5% had received any training on pig production. This shows the low access to extension services and therefore knowledge and information on improved pig production and management. Unavailability of veterinary services was especially high in Wokha (84%) while 50% of Kohima households were unable to diagnose the diseases correctly.

4.5 Labour Use in Pig Production

More women were involved in feeding and cleaning the pigs while men were involved in medication and marketing (Figure 19). In 85% of the households, women cooked the feed while men cooked the feed in only 12% of the households. Young girls were only involved in cleaning the sty and feeding the animals.

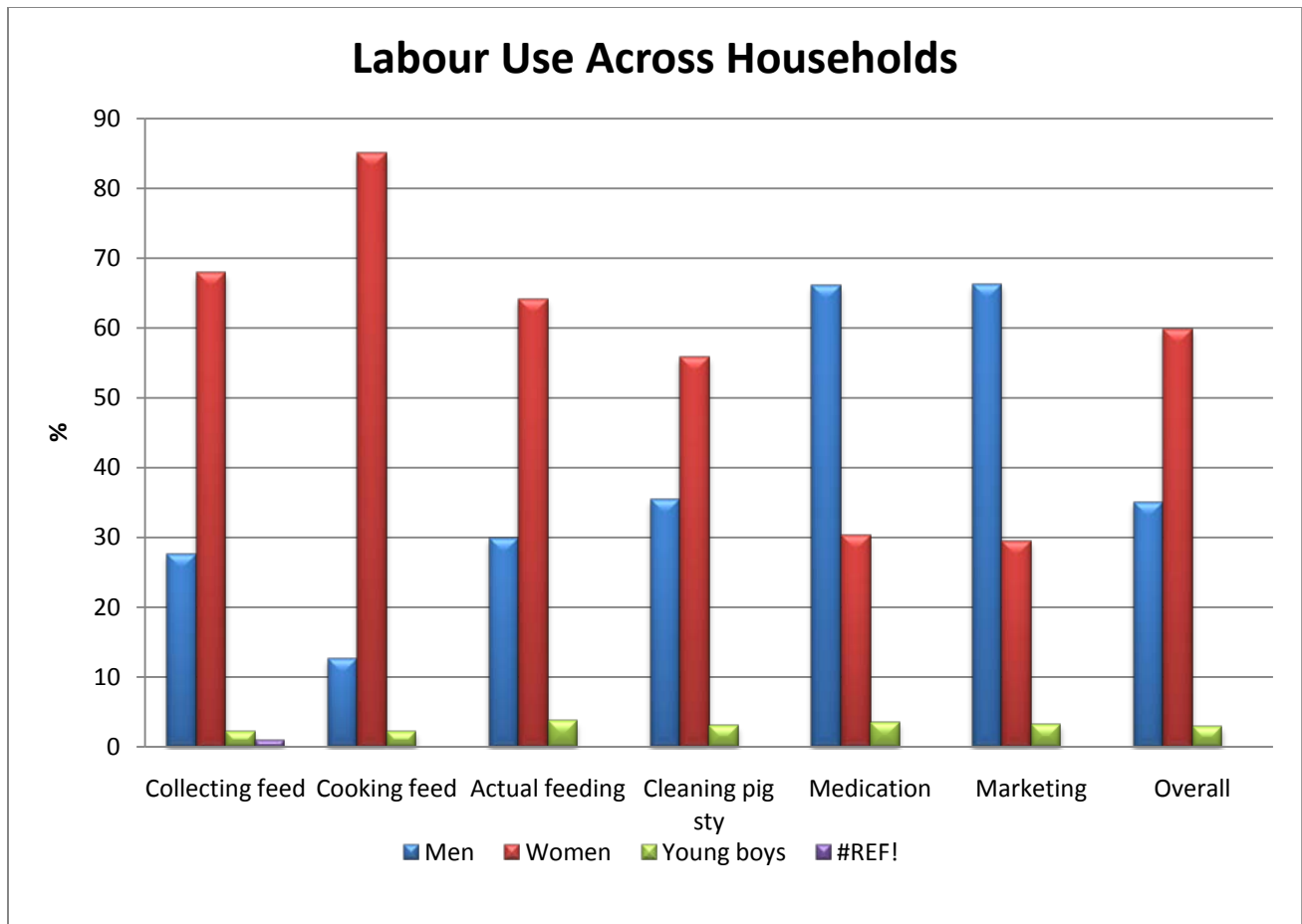


Figure 19: Labour Use in pig production

Collecting, and cooking feeds and cleaning pig sty were carried out once per day and feeding twice per day while medication and marketing were done occasionally. These activities took less than one hour to complete except marketing (two hours). Ninety percent of the labour allocation to different activities remained the same during the summer season. All households that were interviewed used family labour for pig production activities.

4.6 Pig productivity

4.6.1 Productivity parameters

The number of piglets born per sow was used as a productivity parameter. For households keeping Burmese, the mean number of piglets per sow was 14 compared to the large black that had a mean number of piglets of 8.0. Indigenous breeds had an average of 6.9 piglets per sow (see Table 23).

Table 23: Mean number of piglets born and weaned per sow by breed

Breed of the sow	Statistics	Piglets were born the last time the sow gave birth (%)	Piglets died at birth (%)	Piglets reached the weaning stage (%)	Age at first farrowing (months) (%)
Burmese	Mean	14.0	5.0	9.0	14.0
	Std. Deviation	.	.	.	
Large Black	Mean	8.0	1.6	6.4	11.6
	Std. Deviation	3.5	1.9	1.8	
Indigenous	Mean	6.9	1.5	5.4	14.2
	Std. Deviation	2.8	1.7	2.7	

Source: Survey data

Table 24. Total number of weaned piglets among the sampled households

District	Type of pig breed	2 - 6 month males (%)	2 - 6 month females (%)
Kohima	Indigenous/local	3	3
	Large black	20	20
	Hampshire	3	3
	Burmese	4	4
	Cross	2	2
	Total	32	32
Mokokchung	Large black	47	47
	Hampshire	1	1
	Yorkshire (white)	1	1
	Burmese	7	7
	Total	56	56
Phek	Indigenous/local	19	19
	Large black	6	6
	Cross	1	1
	Total	26	26
Wokha	Indigenous/local	8	8
	Large black	3	3
	Cross	16	16
	Total	27	27
Total	Indigenous/local	30	30
	Large black	76	76
	Hampshire	4	4
	Yorkshire (white)	1	1
	Burmese	11	11
	Cross	19	19
	Total	141	141

Despite the Burmese having the highest average number of piglets born; it also had the highest number that died at birth. Sixty four percent of Burmese piglets reached weaning stage compared to the Large Black (80%) and the Indigenous breeds (78.2%).

4.6.2 Factors influencing pig productivity

Ordinary Least squares (OLS) model was run to give an indication of which the management and production factors had an effect on the productivity of pigs. In this model, the dependent variable was the number of pigs born per sow. In other similar studies linking pig productivity and management, pig productivity is defined as the number of piglets weaned per sow per year (Theodoropoulos *et al*, 2009, King *et al*, 1998). As a preliminary test to running the ordinary least squares model, the correlation analysis was performed to compare the number of piglets born in the last sowing to the management and production characteristics. The low correlation between the variables (Table 25) showed the relative independence between variables.

Housing the pigs, the breed of pig and the age of the sow were significant at the 5% and 1% level which implied that due to the relative independence of these explanatory variables, they could be included in the model. The number of times the sow sired was highly correlated with the age of the sow hence the age variable though significant was dropped from the model.

Table 25: Correlation between pig productivity variables

Variable	t-value ¹ / correlation coefficient ²	Sig. (2-tailed)
Number of piglets born / sow		
Was sow housed (no vs. yes) ¹	-2.02**	0.054
Breed of the sow (indigenous vs. other) ¹	3.87***	0.001
Current age of the sow ²	0.403*	0.041
Number of births ²	0.192	0.347
Was sow de wormed (no vs. yes) ¹	-0.38	0.700
Feeding Practice (sty feeding vs. scavenge) ¹	0.05	0.950

Source: Survey data

The factors associated with improved pig productivity included were pig housing, the feeding practise and the number of times the sow has given birth and breed types (Table 26). The large black breed had sired the most times compared to the other breeds however, it sired for the first time at the age of 14 months compared to the indigenous breed which gave birth earlier at 12 months. More deaths of piglets among the Burmese piglets were reported compared to other breeds.

The results show that housing the sow, the type of breed (large black different from Burmese and indigenous) feeding practice and the number of times the sow had given birth were all significant at the 5 or 10% level and positively correlated to the number of piglets born.

Table 26: Factors influencing pig productivity (Number of piglets per sow per year)

Variable	Coefficient	Standard error	t-value	P>t
Sow housed (1=yes)	2.878	1.536	1.87	0.076*
Breed (Burmese)	0.801	1.440	0.56	0.584
breed(Large Black)	6.357	2.659	2.39	0.027**
Feeding practice (1=scavenging)	2.901	1.460	1.99	0.061*
Number of times given birth	1.363	0.661	2.06	0.053*
Number of times given birth squared	-0.106	0.055	-1.92	0.07*
Constant	1.633	1.613	1.01	0.324
R^2	57%			
$Adj R^2$	37%			
<i>Prob F-statistic</i>	0.02			
<i>N</i>	26			

* = Significant at the 10% level; ** = Significant at the 5% level; *** = Significant at the 1% level

The relationship between number of times the sow sired and the piglets born was not linear and hence the number of times sired was squared and this shows that the number of piglets born increased with the number of births up to some level then it starts to decline. These results imply that pig housing, on average, leads to litter size of 3 more piglets, while increase in adoption of large black breed type results in 6 more piglets. The feeding practise that involved scavenging where pigs were allowed to roam freely outside was positively correlated to the piglets born compared to sty feeding. This implies that households that practised scavenging on average have 3 more piglets than sty fed pigs. This can be explained by the diversity in food types that the scavenging pig is exposed to and the exercise involved in scavenging for foods compared to sty feeding where the pig is not exposed to exercise.

5 Pig marketing

5.1 Sale of piglets, pigs and pork meat

Eighteen percent of all households sold piglets, with the highest percentage being from Mokokchung and the lowest from Phek (15%). Households sold an average of three pig lets in the 12 months prior to the survey at 1,890 Rupees. Seventy six percent of the piglets were sold at the village market particularly those in Kohima and Phek districts (67% and 74% respectively). All piglets in Mokokchung and Wokha districts were sold at farm gate. The money received from the sale of piglets was mainly managed by the female spouse (71%) or jointly between head and spouse (25%). The overall control by the head was only 4% implying that spouses had more control over the management of proceeds from sale of piglets.

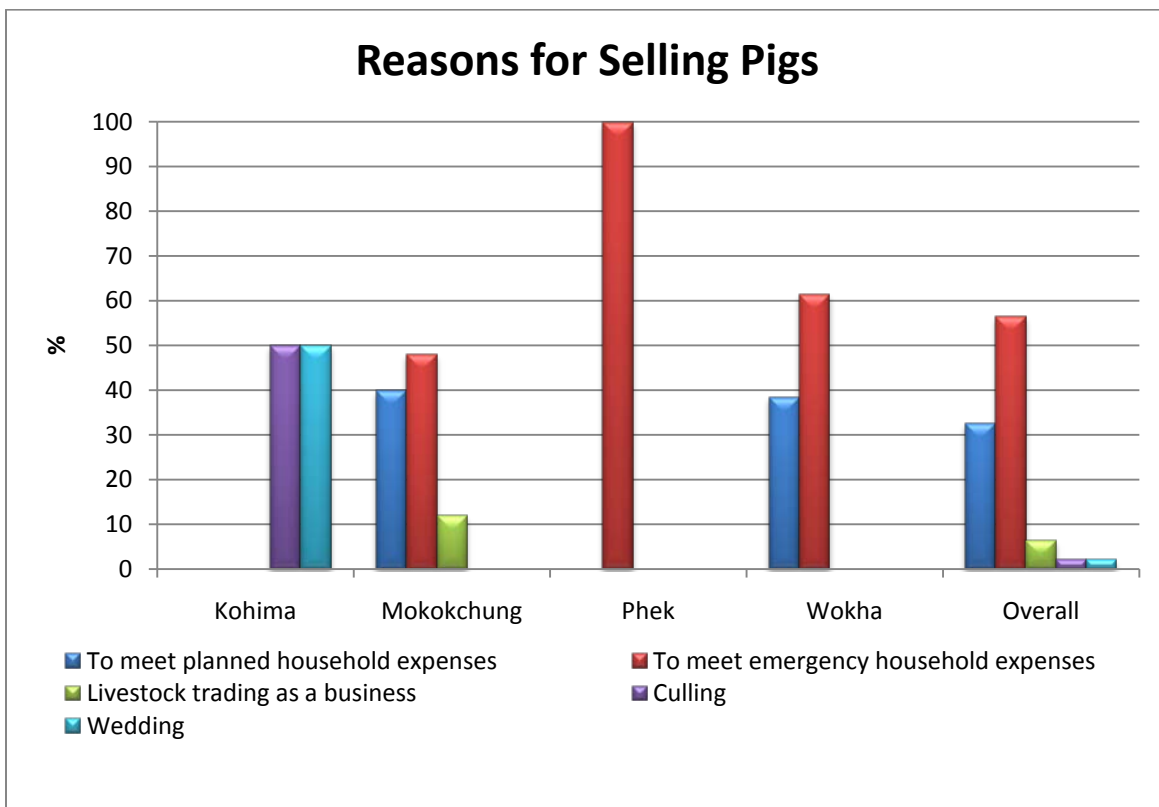


Figure 20: Reasons for selling pigs

Twenty five percent of all households sold pigs. The highest percentage of households that sold pigs were from Mokochung (36%), while the lowest were from Kohima (7%). The average price of pigs was 8600 Rupees per pig. On average, one pig was sold in the 12 months prior to the survey although in Wokha and Phek, an average of two pigs were sold. The pigs were mostly sold at the farm gate (78%), village market (13%), traders /NGOs (4%) and social gathering (4%). In Kohima district, social gatherings were an important forum to sell pigs with 50% of the pigs in the district sold through these gatherings. Fifty seven percent of the respondents sold pigs to meet emergency household expenses while 33% of the sales were for planned expenses (Figure 20).

Twenty seven percent of all households slaughtered pigs during the year with the highest cases of slaughter being in Phek (39%) and the lowest in Mokochung (14%). On average one pig was either slaughtered for sale (67%), ceremony (21%) or household consumption (12%) in the 12 months prior to the survey. The average quantity of pork sold after slaughter was 58kgs, amount consumed was 6.4kgs and given away was 3.8 kgs (Table 27).

Table 27: Quantity of pork consumed and sold by district

District	Statistics	Amount Consumed (Kg)	Amount Sold (Kg)
Kohima	Mean	3.8	76.5
	N	10	10
	Std. Deviation	2.9	22.6
Mokokchung	Mean	9.4	39.0
	N	8	8
	Std. Deviation	10.1	27.1
Phek	Mean	10.9	60.9
	N	11	11
	Std. Deviation	9.0	31.9
Wokha	Mean	2.8	54.1
	N	13	13
	Std. Deviation	2.7	30.2
Total	Mean	6.4	58.3
	N	42	42
	Std. Deviation	7.3	30.2

The pork was mainly sold at the farm gate (49%) and at the village market (48%) while some pork was sold during ceremonies.

5.2 Income from pigs

Household income was computed from incomes of all household members (Figure 21). In sixty five percent of all the households, incomes were earned by the household head while the spouse earned 17% and other male household member (12%). Women irrespective of whether they were a spouse or a female head of household were predominantly involved in business services, sale of livestock products, and keeping livestock.

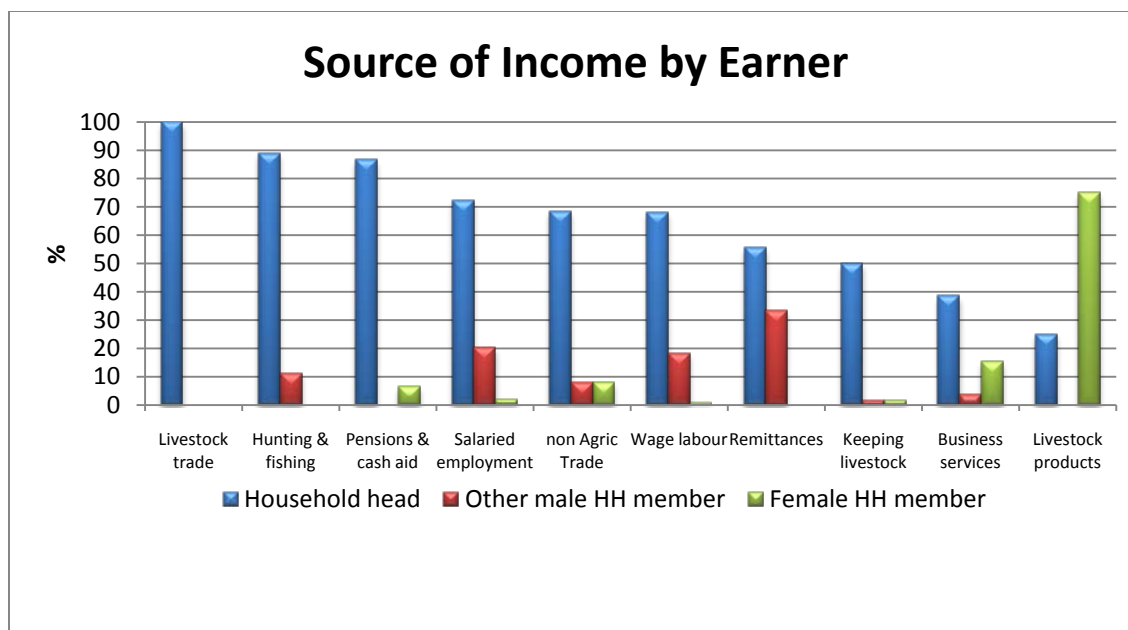


Figure 21: Income sources by who earned the income

The household incomes were computed from all the income sources. Trade in non-agricultural products, livestock trade, business services, wage labour, formal salaried labour, hunting and fishing, pension and remittances were aggregated together as non-farm income.

Table 28. Main source of income for pig owning and non pig owning households

Pig ownership	Statistics	Crops income	Pig income	Other livestock income	Off-farm income	Household income
No pigs	Mean	891.93	-	546.49	24,940.46	26,378.88
	N	57	57	57	57	57
	Std. Deviation	3984.57	.00	1479.56	29885.84	29308.70
Own pigs	Mean	568.48	8,402.87	2,031.80	44,110.31	55,113.46
	N	128	128	128	128	128
	Std. Deviation	2873.74	12877.79	7835.56	58675.30	64546.72
Total	Mean	668.14	5,813.88	1,574.16	38,203.92	46,260.10
	N	185	185	185	185	185
	Std. Deviation	3248.78	11384.10	6596.65	52219.46	57567.75

The income from pigs included sales from piglets, sale of pigs, sale of slaughtered pigs at home, sale of pig manure less breeding costs and costs of disease control. Non-farm

income accounted for the highest proportion of the total household income (74%) followed by income from pigs which was 15% of the total household income (Table 24). The trend was similar across the different districts except in Kohima district where other livestock income accounted for 12% while pig income accounted for 7% of the household income (Table 29).

Table 29: Mean household income from different sources by district

District	Statistics	Total HH income	Non-farm income	Pig income	Livestock income	Crop income
Kohima	Mean	39,085.38	32,196.23	2,610.28	3,231.13	1,047.74
	Maximum	217,520	217,050	25,000	73,000	30,000
	N	53	53	53	53	53
Mokokchung	Mean	66,338.60	53,643.40	10,682.19	1,258.30	754.72
	Maximum	354,000	288,000	94,000	40,800	30,000
	N	53.0	53.0	53.0	53.0	53.0
Phek	Mean	24,600.48	18,071.90	5,660.00	635.24	233.33
	Maximum	162,280	144,000	60,200	5,600	6,000
	N	42	42	42	42	42
Wokha	Mean	52,362.92	47,546.11	3,603.97	718.92	493.92
	Maximum	233,970	219,000	17,600	14,300	3,500
	N	37	37	37	37	37
Total	Mean	46,260.10	38,203.92	5,813.88	1,574.16	668.14

The total mean income for the four districts was 46,260 Rupees. Phek had the lowest income (24,600) and Mokokchung the highest income (66,339). The mean income earned from pigs was 5,814 Rupees and was highest in Mokokchung (10,682) followed by Phek (5,660). The contribution of livestock and crop incomes was quite low implying that investment in pig farming would be a big boost to the farm incomes for the majority of the farmers.

Table 30. Piglet income relative to total pig income and pig income relative to total income

District	Piglets' income relative to pig income (%)	Pig income relative to total income (%)
Kohima	13	7
Mokokchung	35	19
Phek	32	20
Wokha	21	14
Total	28	15

Looking at different sources of pig income, 38% of the income was from the sale of pork, 32% from the sale of pigs and 28% from the sale of piglets (Figure 22). In Phek,

the main source was sale of pork while in Mokukchung, it was from sale of pigs. Only farmers in Wokha sold pig manure.

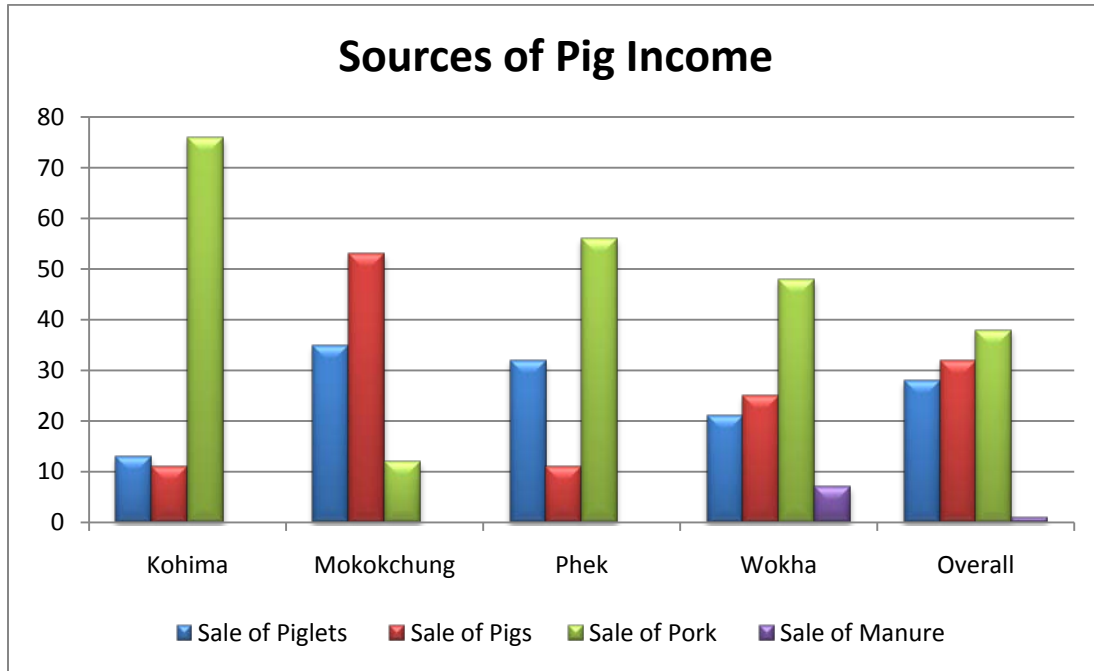


Figure 22: Main sources of pig income

6 Summary

This report provides the baseline situation of pig production, management and marketing in Nagaland. The project interventions are timely in that the improvement of housing, adoption of improved breeds and improvement of feeding practices which are the key interventions of the project have been shown to have a positive impact on productivity as measured by number of piglets per sow. For this to happen however, capacity building and improved access to services will need to be stepped up.

7 References

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