

RESEARCH ARTICLE

SMART AGRICULTURE VILLAGE PROGRAM: EFFECTIVENESS ON SOCIAL, TECHNICAL AND ECONOMIC CHANGES AMONG GOAT FARMERS IN BARDIYA, NEPAL

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ABSTRACT

The study was done to explore the concept and effectiveness of smart agriculture village model program among goat farmers in Bardiya, Nepal from view point of agriculture sustainability. Primary data were collected using semi structured questionnaire with randomly selected 80 households from program implemented villages. Adoption index, scaling technique and before-after impact assessment tools were used for the data analysis. Before, goat farming was of traditional type with low productivity and very less earning in the study area. Study revealed that after the implementation of program, household income from goat farming found significantly increased by 31.41% in the study area. Farmers average annual income from goat raised to NRs. 50987 from NRs. 38800 in the study area. With the intervention of the program, average herd size was increased to 16.99 from 12.69, average numbers of doe increased from 5.23 to 7.09, average number of kids per kidding increased from 1.83 to 2.28, kid's mortality and abortion rate found decreased. After the implementation of program general management obtained highest adoption index of 71.07 and 66.43 in Thakurbaba and Geruwa village respectively followed by health, housing, breeding and feeding practices. Occurrence of disease was found as the most challenging constraints in the study area with 0.80 index value followed by high kids' mortality and expensive feed and forage. Among the surveyed household, 38.75% were satisfied and 36.25% were moderately satisfied with the implementation of program. Based on these findings, although the program model seems successful approach for sustainable community development, the study suggests possible interventions for breed and feed improvement measures and in-depth orientation and follow-up is compulsory before replications.

KEYWORDS

Smart agriculture village program, Goat, Adoption index, Community development, Nepal

1. INTRODUCTION

Nepal, the country of Asia, is a landlocked between two giant economies of the world, India and China. Agriculture is the major sector of Nepalese economy providing employment opportunities to about 66 percent of the total population and contributes about 26 percent in the national GDP (MoF, 2020). Crops and livestock are the major constituent of agriculture and is a cornerstone for the development of national economy. The Nepalese agricultural sector is dominated by the production of basic staple grains, fighting with poverty and food and nutrition security. Here, farming is done by majority of small, resource poor farmers which is subsistent in nature and crop is mostly integrated with livestock for risk minimization.

Globally livestock sector is the principal source of food and employment (Khanal et al., 2022). With changes in demographical, socio-economic and environmental status, the livestock sector in the developing world is facing challenges of low productivity and has become a culprit and a victim of undesirable climate change impacts (Khanal et al., 2022). The poor performance of livestock might be due to in-breeding or negative selection (Devkota et al., 2000). The main reasons for the stagnation of the goat enterprise in Nepal are unscientific management practices, improper breeding, lack of nutrition and problems related to the health and marketing management (HIA, 2012).

In this situation, to provide one stop solution in a holistic approach Lumbini province has implement smart agriculture village (SAV) model program which is supporting farmers in an integrated way expecting outcome of doubling the production and farmers income within a specified period. Climate, nutrient, water, technology and market component were kept in an integrated way within model program to achieve higher productivity with adaptation to climate change. Program would be implemented at specific village for four years with commodity cereals, vegetables, cattle, buffaloes, goats, fish and so on as per demand of community and potentiality of production. In this regard, this study aimed to document and assess effectiveness of the smart agriculture village model program among the goat farmers focusing two villages where the program has been successfully implemented for three years with following specific objectives;

- To explore concept and implementation model of smart agriculture village program
- To derive socio-economic features of goat farmers in the study area
- To calculate level of technology adoption comparing before and after the program implementation in the study area.
- To analyze program's effectiveness on social, technical and economic development in the study area

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2. LITERATURE REVIEW

2.1 Goat in Nepal

Goat (*Capra hircus*), a small ruminant especially has a significant role in the total livestock contribution in Nepal and is mainly adopted by the small as well as marginal farmers whose primary and stable source of income is agriculture (Neupane et al., 2018). Goat contributes 20.69% to the total meat production of the nation and ranks in second position after buffalo (52.81%) with respect to meat production in Nepal contributing 3.17% in AGDP (MOALD, 2019). About 49.8% of the rural people rear goats as a living bank because it can be liquidated whenever necessary (CBS, 2014). Being easily manageable by women and children requiring less capital investment and feeding costs it is better alternative of employment for rural poor (Neupane et al., 2018). Their broad feeding habits, small size, capacity to adapt under unfavorable environment, low maintenance cost, diverse utility, short gestation period and multiple off-springs at a time makes goat have a comparative advantage over other animals (Degen, 2007; Misra and Singh, 2002). Although providing significant contribution in livelihood, Nepalese livestock sector is subsistence nature, where typically a single household manages only a small number of animals. Apart from this, low productive breed, lack of nutrition, low adoption of technology, disease and diffused and disrupted market are the major challenges. Moreover, adoption of improved technologies and management practices in the farmer's flock is very low (Singh and Kumar, 2007).

2.2 Concept and Implementation Model of Smart Agriculture Village Program

The Provincial Government, Lumbini Province Nepal implemented the "Smart Agriculture Village (SAV) Program" through Ministry of Agriculture, Food Technology and Land Management with the aim of increasing the income level of farmers and improving the food security by generating rural employment. The basic objectives of the program were to develop "a model village" with at least 50 households involving in income generation by adopting crop and livestock specific climate adaptation and environment friendly practices, irrigation and advanced production technology along with risk minimization strategies to enhance agriculture production, productivity and quality of products (MoLMAC, 2019). The specific objectives of the program were to enhance sustainable livelihoods by strengthening the productive capacity of farmers by making agriculture products market-oriented, business-oriented, profitable and self-reliant, to conserve and promote agriculture biodiversity and resources available at local level and proper utilization of non-fertile and uncultivated agriculture land, to ensure sustainable food and nutrient security and to minimize the current unemployment rate through generation of employment in agriculture by women and youth entrepreneurship development. In first phase, this program was operated on 52 villages selecting as per recommendation and coordination of elected member of the provincial assembly from concerned province constituency

representing at least one smart agriculture village program in each provincial constituency of 12 districts of Lumbini Province. In the second phase, the program was implemented in each local level.

2.3 Subject Matter of The Smart Agriculture Village Program

According to the model and guideline developed the SAV program was formulated as an integrated and holistic approach focusing overall community development. The program model consists of major five smart components viz; climate, irrigation, nutrient, technology and market by (MoLMAC, 2019). In each village, the program was implemented with the activities that contribute to achieve all five smart components. The subsidy budget of government and contributed budget from public were allocated for each component in a proportionate basis.

- Climate smart: Site-specific climate resilient technologies and practices were adopted under this component. Under this, crop varieties and animal breeds that withstand on harsh climatic conditions along with environment friendly and low energy consumptive traditional and modern technologies and practices are falls. Also, weather forecast and publicity along with other activities giving priorities to the Agriculture Information Centre (AIC) was operated in the village.
- Irrigation smart: On the basis of feasibility and low cost, small irrigation facilities and technologies that ensure irrigation throughout the year were adopted. Safe water drinking with use of advanced technologies was implemented in livestock component.
- Nutrient smart: Under this, sustainable land management or land use mapping, integrated crop and nutrient management, farming system for carbon sequestration in soil and scientific animal nutrient management practices were adoption to increase soil fertility and sustainable animal nutrient management.
- Technology smart: Production of agriculture and livestock were increased emphasizing on adoption of modern technologies encouraging traditional knowledge and techniques more and more, custom hiring center for sustainable agriculture mechanization, animal breed improvement practices etc.
- Market smart: Under this, development of formal market and sustainable market promotion based on value chain by developing community-based collection and processing centers were done. Market support activities were implemented in this component.

Cross-cutting: Cross-cutting component like capacity building and co-learning, gender and social inclusion, youth entrepreneurship development, institutional development and partnership and co-financing, etc. were also included in the program. Provision of one social mobilizer/facilitator was also provided in each village.

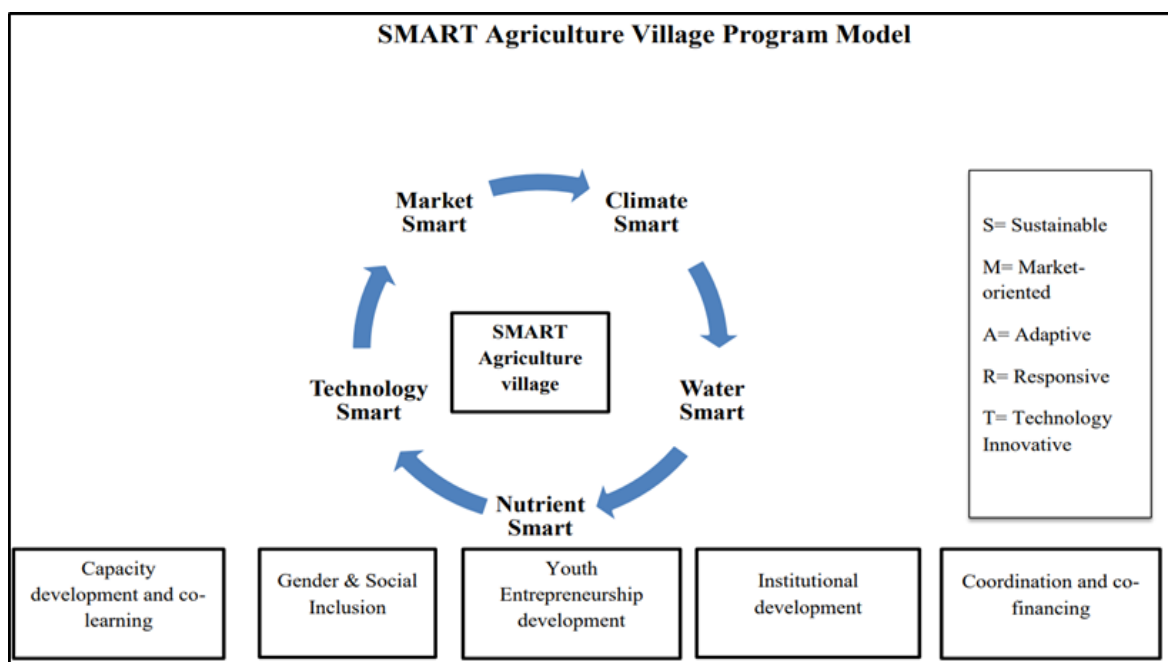


Figure 1: Smart Agriculture Village Program Model (MoLMAC, 2019)

3. MATERIALS AND METHODS

3.1 Study Area, Sample Size and Data Collection

To achieve the objectives of this study, Sahipur village of Thakurbaba municipality and Tingharuwa village of Geruwa rural municipality of

Bardiya district in Lumbini province were selected purposively where smart agriculture village program in goat was implemented since from three years. A field survey was conducted in May, 2022 with randomly selected 40 household from each village as follows;

S.N.	Municipality/Rural municipality	Coordinates	Program implemented village	Total household	Sample size	Sampled percentage
1	Thakurbaba	28.45°N 81.31°E	Sahipur	54	40	74.07
2	Geruwa	28.475°N 81.192°E	Tingharuwa	55	40	72.72

The primary information was collected through household survey using semi-structured interview schedule. One focus group discussion was conducted to validate the data from household survey and to obtain qualitative data for the study. A field team of five local residents well-trained data collectors were deployed in the field for field survey. The questionnaires were in English but questions were asked in the local languages. Secondary data were taken from District office, Directorate and Provincial ministry along with reports, books and internet browsing.

3.2 Data Analysis

After collection of primary data from field survey, information was entered using MS-Excel. Different statistical test and derivations were carried out whenever appropriate. Quantitative data were analyzed by using the both descriptive and analytical statistics. The final analysis was done by using Microsoft Excel.

Socioeconomic and farm characteristics of the respondents like family size, age, occupational pattern, economically active population etc. were described using simple descriptive statistics like frequency count, percentage, mean etc.

3.3 Methodological Approach for Impact/Effectiveness Evaluation

The defines impact assessment as a systematic analysis of “significant or lasting changes in people’s lives, brought about by a given action or series of action (Roche, 1999). For impact evaluation of the program in the implemented village Before-After approach was employed and analyzed using paired t-test. Information on technology adoption, technical parameters of goats, farmer’s income and social indicators before the project were compared with the information after the program implementation.

3.4 Indexing

Scaling techniques provides the direction and extremity attitude of the respondent towards any proposition (Miah, 1993). The problems faced by the goat farmers in the study area were ranked by using scaling technique comparing intensity of different levels of using scale values 1, (1-1/n), (1-2/n), (1-3/n) and so on where;

$$I = \sum Sifi / N$$

Where,

$$I = \text{index } 0 < I < 1$$

Si = scale value at ith severity

fi= frequency of the ith severity

N = total number of respondents = $\sum fi$

3.5 Level of Technology Adoption

Extent of technology adoption by goat farmers in the study area before and after the program implementation was done by the technique of scoring. Firstly, score was allotted to different technology and the level of technology adoption for broad group was calculated by using the following formula (Dongol, 2004).

$$\text{Adoption index (AI)} = 100 \times \frac{\text{Total score obtained by an individual}}{\text{Maximum possible score}}$$

Further, to find out the extent of adoption of technologies under different broad group was illustrated using percentage for both before and after the program implementation in the study area.

4. RESULTS AND DISCUSSION

4.1 Socio-Demographic Profile of Sampled Goat Farmers in The Study Area

Among the sampled farmers, 32.5% were male and 67.5% were female in the study area. Female respondents were higher (77.5%) in Thakurbaba. On an average the respondent and household age were 39.65 years and 52.1 years respectively. The age of household head seems higher in the study area and reported that age factor negatively affected the adoption of integrated pest management practices (Ghimire and Kafle, 2014).

The average family size was 5.7 with 3.4 average numbers of economically active family members including about 58% of economically active members in the study area. About 60% of household in the study area were nuclear type and among the sampled households 86.3% household’s primary source of income was agriculture. Majority of the population in the study area were found illiterate (58.6%). All the family members in the study area were found involved in committee, 87.5% had received goat related training. Only 25% household found access with credit in the study area. Majority (42.5%) of respondent were found having experience in between 3 and 7 years. The details of demographic characteristics of respondents are shown in table 2 below.

Characteristics	Thakurbaba	Geruwa	Total (N=80)
Gender of respondent (%)			
Male	22.5	42.5	32.5
Female	77.5	57.5	67.5
Average family size (Number)	5.7	5.8	5.7
Age group of the sampled farmers (%)			
≤15 years	23.5	23.3	23.4
16-59 years	56.1	59.9	58.0
≥60 years	20.4	16.8	18.6
Average number of economically active members in a household	3.2	3.4	3.4
Average age of respondent (years)	38.3	41.0	39.65
Average age of HH head	54.2	49.8	52.1
Family type (%)			

Table 2: Socio-demographic profile of goat farmers in the study area

Characteristics	Thakurbaba	Geruwa	Total (N=80)
Joint	42.5	37.5	40.0
Nuclear	57.5	62.5	60.0
Education status of sampled household (%)			
Illiterate	52.5	65.0	58.6
Literate	47.5	35.0	41.4
Average education of Household head (education Years)	3.2	2.5	2.9
Primary source of income (%)			
Agriculture only	87.5	85.0	86.3
Agriculture and Others	12.5	15.0	13.7
Training received and credit availability (%)			
Respondent involved in goat training	92.5	82.5	87.5
Access of credit	32.5	17.5	25.0
Involved in farmers group/committee	100.0	100.0	100.0
Experience in goat farming (Years)			
>3 years	17.5	25.0	21.3
3-7 years	45.0	40.0	42.5
<7 years	37.5	35.0	36.2

Source: Field survey, 2022

4.2 Household Income Analysis

Goats are the most prolific domesticated ruminants; farmers are increasingly relying on goats as means of survival and a way of boosting their income (Peacock, 2005). Table 3 presents the comparison of annual household income before and after implementation of the smart agriculture village (SAV) program. Using paired sample t-test, household income from goat was found significant different after the implementation of the program. After the implementation of SAV program, household income from goat farming found significantly increased by 31.41% and is

significant at 1% level. Similarly, average annual income from goat farming after the program implementation were also found significantly increased by 33.06% in Thakurbaba and 29.68% in Geruwa (Table 3). This increased in income may be due to reduction in cost of production, increased production due to introduction of productive breed and good management and also increased in herd size and market price of the live goat. The study result is in line with reported that the average annual income from the goat per household was found to be almost doubled from NRs. 8,489 to 15,084 after project supported by Heifer International in Nawalparasi district (Aryal et al., 2019). Also, reported the average income from goat sale was estimated to be Rs 11,299 per household (Thakur et al., 2003).

Table 3: Household income from goat farming before and after the implementation of smart agriculture village program in the study area (2022)

Thakurbaba (N=40)	Before program	After program	Mean difference	t-value	P value
Income from goat (NRs)	39775±(13559.9)	52925±(18753.9)	13150***	6.459	0.000
% increase in income = 33.06% df (degree of freedom) = 39					
Geruwa (N=40)	Before program	After program	Mean difference	t-value	P value
Income from Goat (NRs)	37825.3±(9906.9)	49050±(15556.2)	11225***	5.236	0.000
% increase in income = 29.68% df (degree of freedom) = 39					
Total (N=80)	Before program	After program	Mean difference	t-value	P value
Income from Goat (NRs)	38800±(11840.1)	50987±(17230.7)	12187.5***	8.275	0.000
% increase in income = 31.41% df (degree of freedom) = 79					

Figures in parentheses indicate standard deviation

Source: Field survey, 2022

*** Significant at 1%

4.2 Effectiveness of Program on Performance of Goat

Table 4 below showed the effectiveness of SAV program on performance of goat in the study area. The study resulted that with the intervention of the program average herd size increased to 16.99 from 12.69 at the study area. Similarly, Average doe size found to be minimal increased from 5.23 to 7.09, average number of kidding in 2 years increased from 2.29 to 2.56,

Average number of kids per kidding increased from 1.83 to 2.28 and Average weight of kids also increased from 2.11 to 2.78 kg. This increment may be due to introduction of productive breed, well housing management and adoption of health measures. In this study, kid's mortality rate was found decreased from 24% to 12% and rate of abortion was also found decreased from 23.80% to 13.28%. The decrease in kid's mortality and rate of abortion may be due to regular access of veterinary services in the village, improved management practices and establishment of breed improvement centers in the villages with the intervention of SAV program.

Table 4: Effectiveness of program on goat performance in the study area

Parameters	Thakurbaba (N=40)		Geruwa (N=40)		Total (N=80)	
	Before program	After program	Before program	After program	Before program	After program
Average Herd Size (no.)	15.13	21.03	10.25	12.95	12.69	16.99
Average no. of doe	6.95	9.57	3.50	4.6	5.23	7.09
Kids Mortality in %	23.55	10.67	25.75	13.47	24.65	12.07
Average no. of kidding in 2 years	2.32	2.72	2.25	2.40	2.29	2.56
Average no. of kids per kidding	1.80	2.25	1.85	2.30	1.83	2.28
Average weight of kids in kg	2.21	2.82	2.01	2.73	2.11	2.78
Rate of abortion %	22.30	13.87	25.30	12.68	23.8	13.28

Source: Field survey, 2022

4.3 Effectiveness of Program on Adoption of Goat Production Technologies

Table 5: Adoption of goat production technology before and after the SAV program implementation

S.N.	Technologies	Thakurbaba		Rank order	Geruwa		Rank order
		Before program Adoption Index	After program Adoption Index		Before program Adoption Index	After program Adoption Index	
1	Housing	12.92	60.00	III	15.83	55.42	III
2	Feeding	7.50	53.33	V	13.33	49.17	V
3	Breeding	23.50	55.00	IV	21.50	49.50	IV
4	Health	26.50	65.50	II	25.50	65.00	II
5	General management	23.57	71.07	I	22.86	66.43	I
Total (average)		18.80	60.98		19.98	57.10	

Source: Field survey, 2022

Goat production technology is the combination of breeding, health, nutrition, management, pasture, fodder and agro-forestry (Nepali et al., 2010). In this study, housing, feeding, breeding, health and general management aspects were taken to measure the level of adoption.

Overall adoption index for goat production technology before and after the implementation of program in the study area is presented in table 5 which reveals that general management (71.07 and 66.43) obtained highest adoption index in both Thakurbaba and Geruwa village followed by health, housing, breeding and feeding practices. The adoption index for all the practices were found higher than 50 at Thakurbaba but feeding and breeding practices were found below 50 at Geruwa. In the study area farmers found adopted 60.98% and 57.10% on an average of the goat related technologies at Thakurbaba and Geruwa respectively. Similarly, Aryal et al., (2019) reported 65.61% adoption in housing technology, 73.75% adoption in feeding, 82% adoption in breeding, 97.67% in health and 79.31% in care and management after project in Goat farming at Nawalparasi. The smart agriculture village program found effectiveness in transfer of technologies within general management, health, housing and breeding practices in the study area which may be due to trainings, tours, health camps and other technical events in the villages. More focus is needed to improve adoption of feeding and breeding technologies of goat in the study area. Similar to this result, mentioned that the lower income of the farmers is due to prevalent traditional methods and technologies of goat production where healthy and appropriate feeding practice is lacking (Nepali et al., 2007).

4.4 Practice Wise Distribution of Respondents According to The Adoption of Improved Goat Farming Technologies Before and After Program Implementation

Awareness of an available technology is a prerequisite for accessing and using it (Obinna and Onu, 2021). The detail about the adoption percentage of individual activities under broad parameters of housing, feeding, breeding, health and general management are presented in table 6. The study revealed that improved goat shed (100) and use of feeding and watering devices (87.5), feeding mineral supplements and vitamins (100), vaccination (96.25) and castration practices (100) found almost fully adopted in the village by goat farmers. Higher adoption of those technologies may be due to implementation of program activities linked with subsidy through smart agriculture village program. Adoption of slatted floor (2.50), Feeding of concentrates as recommended (20.0), Flushing prior to breeding (6.25), azolla/silage feeding (38.75), changing buck at recommended interval (30.0), isolation of sick animals (40.0), farm record keeping (33.75), weaning (37.50) and use of ICTs/market information (40.0) practices fall under very low level of adoption category in the study area. The lower level of adoption of those practices may be due to lack of awareness, inadequate and practical based trainings, higher level of illiteracy in the study area. The result is in line with (Gunaseelan et al., 2018).

Table 6: Practice wise distribution of respondents according to the adoption of improved goat farming technologies before and after SAV program implementation

S.N.	Parameters	Thakurbaba Average % (N=40)		Geruwa Average % (N=40)		Total Average % (N=80)		Rank order
		Before	After	Before	After	Before	After	
A.	Housing							
1.	Improved goat shed	27.5	100	20.0	100	23.75	100	I
2.	Recommended floor space	7.5	77.5	2.5	70.0	5.00	73.75	III
3.	Use of feeding and watering devices	32.5	95.0	32.5	80.0	32.50	87.50	II
4.	Proper drainage facility	17.5	50.0	20	57.5	18.75	53.75	IV
5.	Adoption of slatted floor housing	0.0	5.0	0.0	0.0	0.00	2.50	V
B.	Feeding							
1.	Feeding of concentrates as recommended	5.0	15.0	12.5	25.0	8.75	20.00	V
2.	Feeding mineral supplements and vitamins	7.5	100.0	20.0	97.5	13.75	98.75	I
3.	Flushing prior to breeding	0.0	12.5	0.0	0.0	0.00	6.25	
4.	Colostrum feeding to kids (<1 hr after birth)	12.5	82.5	12.5	75.0	12.50	78.75	II
5.	Forage and fodder cultivation	20.0	65.0	35.0	65.0	27.50	65.00	III
6.	Azolla/silage feeding	0.0	45.0	0.0	32.5	0.00	38.75	IV
C.	Breeding							
1.	Identification of does in heat	12.5	50.0	15.0	47.5	13.75	48.75	III
2.	Pregnancy verification	52.5	65.0	32.5	62.5	42.50	63.75	II
3.	Adoption of AI technology	22.5	40.0	22.5	37.5	22.50	38.75	IV
4.	Use of improved buck	20.0	95.0	25.0	65.0	22.50	80.00	I
5.	Changing buck at recommended interval	10.0	25.0	12.5	35.0	11.25	30.00	V
D.	Health							
1.	Vaccination	20.0	100.0	25.0	92.5	22.50	96.25	I

Table 6: Practice wise distribution of respondents according to the adoption of improved goat farming technologies before and after SAV program implementation

2.	Deworming	32.5	72.5	32.5	80.0	32.50	76.25	II
3.	Dipping	32.5	60.0	27.5	65.0	30.00	62.50	III
4.	Farm disinfection	27.5	57.5	22.5	45.0	25.00	51.25	IV
5.	Isolation of sick animals	20.0	37.5	20.0	42.5	20.00	40.00	V
E.	General Management							
1.	Weaning	20.0	37.5	17.5	37.5	18.75	37.50	IV
2.	Tagging/Insurance	12.5	95.0	12.5	77.5	12.50	86.25	II
3.	Farm record keeping	17.5	32.5	0.0	35.0	8.75	33.75	V
4.	Castration	60.0	100.0	50.0	100.0	55.00	100	I
5.	Use of ICTs/market information	17.5	40.0	37.5	40.0	27.50	40.00	III

Source: Field survey, 2022

4.5 Perceived Change in Social, Technical and Economic Parameters After Implementation of SAV Program

Respondent’s perception was taken to response on social, technical and economic parameters to find out the effectiveness of the program in the village. Farmers perceived that there were increased in income from goat farming after the implementation of program which is a good indicative sign. Similarly, more than 50% of the respondents perceived increased in women participation on executive body, frequency of training, visit of

technical service provider, level of awareness, insurance, frequency of veterinary health camps and social inclusion and mobilization after the implementation of program in the study area. Majority of respondents also perceived that there is increased work load in women after implementation of program this is might be due to higher involvement of women in goat rearing and lack of women friendly machineries and tools. Employment opportunity and utilization of local resources also perceived as increased after the program in the study area (Table 7). Farmers indicated outbreak of disease as major constraints in the study area and perceived increased disease outbreaks.

Table 7: Perceived change in social, technical, and economic parameters after implementation of SAV program in the study area (2022)

S.N.	Parameters	Responses percentage (N=80)			
		Increased	Decreased	Same	No idea
1.	Income from goat	71(88.8)	4(5.0)	5(6.3)	0(0.0)
2.	Women Participation on executive body	69(86.3)	0(0.0)	11(13.8)	0(0.0)
3.	Frequency of Trainings	59(73.8)	0(0.0)	17(21.3)	4(5.0)
4.	Work load on women	53(66.3)	11(13.8)	14(17.5)	2(2.5)
5.	Women participation on community meetings	49(61.3)	5(6.3)	23(28.8)	3(3.8)
6.	Employment opportunity	47(58.8)	9(11.3)	24(30.0)	0(0.0)
7.	Utilization of local resources	38(47.5)	22(27.5)	12(15.0)	8(10.0)
8.	Visit of technical service provider	62(77.5)	4(5.0)	14(17.5)	0(0.0)
9.	Disease outbreak	35(43.8)	24(30.0)	17(21.3)	4(5.0)
10.	Level of awareness	73(91.3)	0(0.0)	7(8.8)	0(0.0)
11.	Stool/blood sample tests services	47(58.8)	4(5.0)	12(15.0)	17(21.3)
12.	Insurance	68(85.0)	0(0.0)	12(15.0)	0(0.0)
13.	Frequency of veterinary camps/ health camps	74(92.5)	0(0.0)	6(7.5)	0(0.0)
14.	Social inclusion and social mobilization	53(66.3)	11(13.8)	15(18.8)	1(1.3)

Source: Field survey, 2022

4.6 Satisfaction Level of Respondent Towards Smart Agriculture Village Program

Among the sampled households, different levels of satisfaction were asked to response. Figure 2 revealed that the major percentage of the sampled respondent in the study area was found satisfied (38.75) with the

implementation of program. Majority of the respondent i.e. 36.25 percent lied in the moderately satisfied group. Only 11.25 percent of the respondent lied in the highly satisfied group whereas, 10.0 percent were neutral. Only, 3.75 percent of the respondent was found not satisfied with the program implemented in the study area (Figure 2).

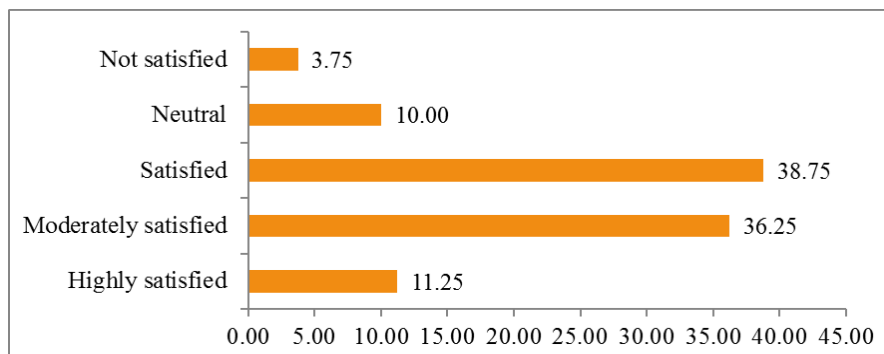


Figure 2: Satisfaction level of respondent towards SAV Program implementation (2022)

4.7 ICTs Used by Farmers in The Study Area

Information source helps farmers in the technology transfer and adoption of any agriculture practices and technologies. In this study, about 33 percent of respondent put their opinion that mobile as the major source of information. Likewise, radio was the source of information for 30.38 percent of household followed by computers i.e. Agriculture Information Centre for 24.05 percent. Newspaper and television source were found very rarely used as information source by the respondent in the study area (Figure 3). It may be due to the remoteness and inaccessibility of these sources in the district.

As per the SAV program concept, there was a provision of establishing one Agriculture Information Centre (AIC) in each village with facilities of computer, photocopy, printer, internet and other technical materials. The basic objective of this AIC was to provide instant and technical information to the farmers and raise their level of awareness with means of audio-visual system. The AIC was facilitated by a social mobilizer appointed by the village level committee in a salary basis tied with grants. This study resulted that about 24 percent of farmers taking information from the established AIC.

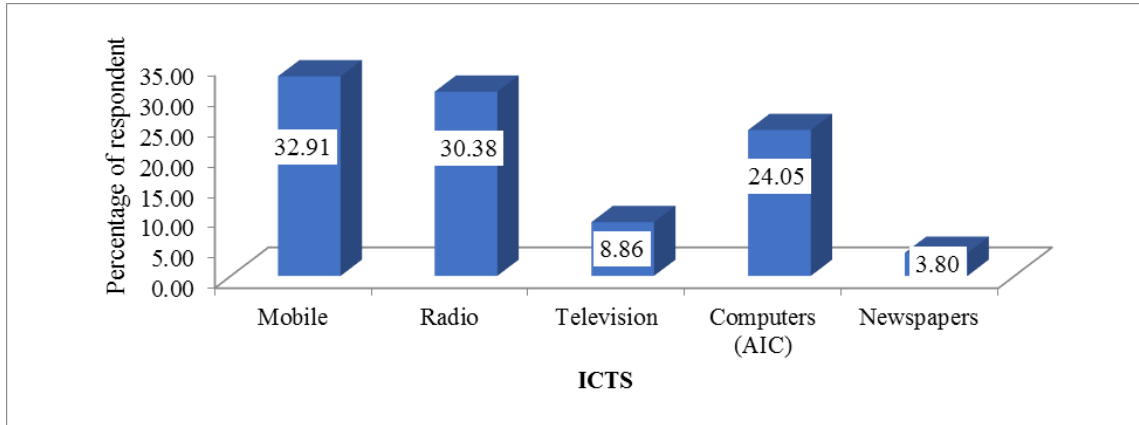


Figure 3: ICTs used by goat farmers in the study area Source: Field survey, 2022

4.8 Constraints in Goat Farming

Respondent under study pointed occurrence of disease was the most challenging constraints in the study area scoring 0.80 index value. Similar to this result, reported disease of small ruminants as a major production constraint and resulted higher index for health care constraint in his study in Chitwan, (Nepal Dhakal et al., 2021). High kids' mortality and expensive feed and forage were the second and third most severe problem with index

value 0.76 and 0.65 respectively (Table 8). Similar to this, reported that feeding and health facilities related constraints were major ones in his study (Nepali et al., 2007). Lack of technical know-how among the goat farmers was put on as fourth severe problem with value 0.64 whereas, respondent put marketing problem as least severe in goat farming in the study area (Table 8). Also, (Singh, 2017) mentioned extension agencies have to arrange training and demonstration programs of improved practices for goat keepers.

Constraints	Thakurbaba (N=40)	Geruwa (N=40)	Total (N=80)	
	Index Value	Index Value	Index Value	Rank
Lack of technical know-how	0.63	0.65	0.64	IV
Occurrence of disease	0.80	0.80	0.80	I
High kids' mortality	0.74	0.78	0.76	II
Expensive feed and forage	0.67	0.64	0.65	III
Marketing problem	0.21	0.29	0.25	VII
Poor technical services	0.48	0.41	0.45	VI
Unavailability of improved breed	0.47	0.44	0.46	V

Source: Field survey, 2022

5. SUMMARY AND CONCLUSION

The Smart agriculture village program interventions in this study showed significant increment in household income from goat farming, increased rate of technology adoption, increased herd size, increased women participation, increased number of trainings with decreased kids' mortality and rate of abortion which depicts that the program has brought effective change in social, technical and economic development in the rural livelihood. Based upon the result, as occurrence of disease is marked as major constraint in goat farming and presence of kid's mortality and abortion rate exist in the village, small unit of dispensary service with veterinary technician and artificial insemination unit is highly suggested. Sustainable goat production can only be achieved with the availability of health care services. More focus is needed to improve adoption of feeding and breeding technologies of goat in the study area. Further, in-depth village level orientation with demonstration of efficient technologies and adequate follow up is suggested prior to program implementation. Mobile was the major source of information so that agriculture information center should start the bulk sms system for providing rapid information. With conclusion, this program can be recommended for replication to the villages where integrated goals of community development are to be met along with agriculture and livestock sector development.

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