



Mobile based agro-advisory services in livestock management by tribal of Meghalaya

RAM SINGH¹, ASHOK KUMAR², P C JAT³ and S P AHMED⁴

Central Agricultural University, Barapani, Meghalaya 793 103 India

Received: 7 March 2016; Accepted: 26 May 2016

ABSTRACT

Meghalaya, state of North-East India, predominantly depend on animal husbandry and agriculture for their livelihood. This study covers the queries of agro-advisory lab registered farmers regarding the various aspects of animal husbandry management including poultry and fishery management for a period of 2.5 years i.e., from June 2013 to December 2015. Farmers were more interested to get information regarding livestock/poultry health management (35.95%) followed by training on animal husbandry (17.66%), schemes on pig/poultry (11.15%), source of piglets/chicks (10.70%), breeding management (10.44%), fishery management including source of fingerlings (3.03%) and housing management (1.87%). The programme has gained high popularity among the tribal farmers of Meghalaya and a sufficient numbers of farmers have been found to be benefitted through the agro-advisory service in the livestock as well as poultry and fishery sectors since number of queries raised by the farmers were found to be increased with the time. It increased from 178 numbers (15.88%) during 2013 to 529 (47.19%) in 2015. Impact assessment revealed that 19.72% of these farmers have been benefitted in animal husbandry from the agro-advisory service. Hence, Mobile Based Agro-Advisory service should be supported by the state department to uplift such types of programmes which will be helpful in improving livelihoods and socio-economic status of the rural tribal farmers in the state in a rapid way.

Key words: Animal husbandry, Fishery, Livelihood, Meghalaya, Mobile based agro-advisory, Poultry

Meghalaya, bounded on the North and East by Asom and on the South and West by Bangladesh, is a small state with an area of 22,429 sq. km with a total population of 29,66,889 (Population Census 2011). The state of Meghalaya has 11 districts namely, East Khasi Hills, West Khasi Hills, South West Khasi Hills, East Garo Hills, West Garo Hills, North Garo Hills, South Garo Hills, South West Garo Hills, Ri-Bhoi, East Jaintia Hills and West Jaintia Hills. The bulk of the population belongs to 3 major tribal communities, i.e. Khasis (45%), Garos (27.5%) and Jaintias (2.5%). In Meghalaya, about 80–85% of the total human population is non-vegetarian and livestock ownership is more evenly distributed among landless labourers, small and marginal farmers. Most of the livestock rearers are below the poverty line. Around 2 lakh milch cows and buffaloes are spread over 5,000 villages of the state. About 1.64 lakh households are engaged in rearing animals and other allied activities. The availability of unproductive animals in the state is less and as such the demands of beef

could not be met within the state. According to 19th Livestock Census, livestock population is dominated by cattle with 8.79 lakh indigenous and 26.4 thousand crossbred cattle in the state. Pig population is also substantial at 5.69 lakh, the next is 4.72 lakh goats and the poultry population is 35.65 lakh out of which a few number of ducks, drakes and ducklings about 20.99 thousand. The total numbers of animals slaughtered annually during the last four years were estimated about 1.89 lakh cattle, 1.81 lakh pigs and 1.26 lakh goat. Out of which about 40% of cattle, 11.25% pig and 18.36% goats were imported from outside of the state. Therefore, development of livestock and poultry is very essential to improve the socio-economic status of people of the state. The returns from livestock sector especially from dairy and mixed farming in small and medium holdings is larger and highly sustainable. It implies that there are more income and employment opportunities for smallholders in the livestock production than in land-intensive crop production. The progress, therefore, in this sector will result in more balanced development of rural economy (19th livestock census 2012, GoM 2015). In the state, agricultural operations having limitations due to its topography, climatic conditions and socio-economic conditions claiming only about 10% of the total land for cultivation, hence, livestock and poultry are

Present address: ¹Associate Professor (ramsingh.cau@gmail.com), ⁴Agro-associate, m4agriNEI, School of Social Sciences, College of Post Graduate Studies, ²Scientist, Division of Animal Nutrition, ICAR RC. ³Senior Scientist, ICAR-ATARI, Zone-III.

the only alternative avocation for villagers for a subsidiary living. In the state, application of information and communication technologies (ICTs) could benefit animal husbandry sector, especially in bringing changes in the socio-economic conditions of the poor in the difficult areas. Therefore, an agro-advisory system has been launched in June, 2012 under the project “Development and Deployment of Mobile Based Agro-advisory System in North-East India (hereafter called m4agriNEI)” by the Central Agricultural University (CAU) at Barapani, Meghalaya. The system was started with the collaboration of Media Lab Asia, New Delhi and was funded by the DeITY (Department of Information and Technology) Government of India, New Delhi with an objective to empower the farmers by providing right information on right time through a mobile based agro-advisory system (Singh *et al.* 2015).

As livestock rearing is one of the primary sources of income for the rural tribal farmers of Meghalaya, scientific livestock management with proper information about livestock is essential to improve livelihoods and socio-economic status of those farmers in the state. With this objective, the present study was carried out to analyse the role played by mobile based agro-advisory service in management of livestock by the tribal farmers of Meghalaya.

MATERIALS AND METHODS

Locale of the study: The agro-advisory lab covered 4 districts of Meghalaya, viz. Ri-bhoi, East Khasi Hills, West Jaintia Hills and West Garo Hills. So far the agro-advisory service is being provided to 47 villages of Ri-Bhoi, 21 villages of East Khasi Hills, 4 villages of West Jaintia Hills and 13 villages of West Garo Hills districts in Meghalaya. The project has registered more than 6,829 farmers from four districts of Meghalaya, out of which 4,217, 1,193, 915 and 508 farmers are from Ri-Bhoi, East Khasi Hills, West Jaintia Hills and West Garo Hills districts, respectively. The farmers raised their queries directly to the agro-advisory lab on need basis. So far lab has received more than 5,256 queries on various aspects of crop farming, animal husbandry and fishery of which 1,087 been received on Animal Husbandry Sector and 34 on Fishery Sector from farmers during the period of June, 2013 to December, 2015. The agro-advisory lab consisted of Level-I and Level-II experts, who are responsible for receiving and providing information to the queries raised by the farmers, if the queries raised by the farmers are beyond the Level-I (Agro-Associate) ability, the queries are referred to the Level-II experts (CAU professors, ICAR-NEH Scientists and experts from line department) and then only the solution is provided to the farmers. Level-I experts visited the livestock farmers on need basis and provided immediate solutions for the management of livestock including poultry and fishery. These solutions were collected in a mathematical manner and furnished as in following given heading of results and discussions.

RESULTS AND DISCUSSION

Analysis of farmers' queries and solutions on animal husbandry including fishery management

The m4agriNEI lab has already completed Phase-I (June 2012 to Nov. 2014) and Phase-II (Dec 2014 to Nov 2017) is in progress. The registered farmers raised queries to the agro-advisory lab related to agriculture, animal husbandry, fisheries, schemes, source of seeds and on any other related sectors. On Animal Husbandry sector most frequently, asked questions were on livestock/poultry health management (35.95%) followed by animal husbandry training (17.66%), schemes on pig and poultry (11.15%), source of poultry chicks and piglets (10.70%), breeding management (10.44%), on fishery, most commonly farmers asked about the source of fingerlings (3.03%) and housing management of pig (1.87%). Other queries (9.19%) raised by the farmers included questions regarding fowl pox, pig constipation, cough, fever in livestock, livestock accident cases viz. fracture, dog bite etc. Different types of queries raised by the farmers related to animal husbandry and the number of each type of query are depicted in detail in Table 1 (Fig. 1).

The Agro-Advisory lab comprised of 6 desktops occupied by Agro-Associates which are Level-I experts for receiving and providing information to the queries raised by the farmers through the Toll Free Number (1800–22–3700). Queries on livestock management are advised instantly regarding prescription of veterinary medicine with the help of Level-I expert. Queries on training are conducted as per request by the farmers with the help of Level-I expert and resource persons from specific discipline. In case the queries raised by the farmers are beyond the Level-I (Agro-Associate) ability, the queries are referred to the Level-II experts (CAU professors, ICAR-NEH Scientists and experts from line department) and then only the solution is provided to the farmers. For queries on schemes, the lab experts refer to nearest department of the concerned scheme. The lab experts had provided advisories to all the queries which were raised by the farmers. Different solution is of the

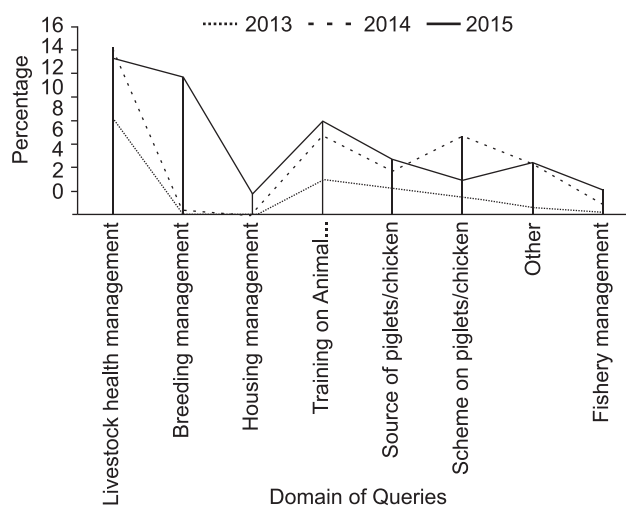


Fig. 1. Domain of queries, June 2013 to December 2015.

Table 1. Queries raised by the farmers to the laboratory on various domain of livestock

Domain of queries	No. of queries			Total
	2013	2014	2015	
Livestock health management	93	160	150	403
	(8.30)	(14.27)	(13.38)	(35.95)
Malnutrition in pig	32	53	17	102
				(9.10)
Deworming in pig/goat	17	31	37	85
				(7.58)
Diarrhoea in pig/goat	27	36	11	74
				(6.60)
Preventive measures for Ranikhet disease	8	26	35	69
				(6.16)
Skin infection in pig/calf	9	14	23	46
				(4.10)
Best time of weaning/Partial/complete weaning	0	0	22	22
				(1.96)
Age of piglet/calf castration	0	0	5	5
				(0.45)
Training on animal husbandry Scheme	33	76	89	198
	(2.94)	(6.78)	(7.94)	(17.66)
	17	75	33	125
	(1.52)	(6.69)	(2.94)	(11.15)
Pig	9	37	16	63
				(5.62)
Poultry	8	38	17	62
				(5.53)
Source	25	42	53	120
	(2.23)	(3.75)	(4.73)	(10.70)
Poultry chicks	17	25	23	65
				(5.80)
Piglets	8	17	30	55
				(4.90)
Breeding management	2	5	110	117
	(0.18)	(0.45)	(11.69)	(10.44)
Artificial insemination in Pig	2	5	21	28
				(2.49)
Age of puberty/Sexual maturity/Heat detection/Cycle length/Anestrus	0	0	26	26
				(2.32)
Signs and symptoms of parturition/Number of piglets after parturition	0	0	24	24
				(2.14)
Pregnancy diagnosis/Gestation period of livestock	0	0	18	18
				(1.60)
Management of pregnant sow	0	0	11	11
				(0.98)
Prevention of crushing of piglets by sow	0	0	7	7
				(0.62)
Abortion	0	0	3	3
				(0.27)
Other	7	47	49	103
	(0.62)	(4.19)	(4.37)	(9.19)
Fishery management	1	9	24	34
	(0.09)	(0.80)	(2.14)	(3.03)
Housing management of pig	0	0	21	21
				(1.87)
Total	178	414	529	1121
	(15.88)	(36.93)	(47.19)	

Figures in the parenthesis indicate percentage to total.

farmers' queries regarding livestock/poultry health management, breeding management, housing management, training, source and scheme of livestock, fishery management and the domain other queries provided by the lab experts are depicted in Tables 2–7 respectively.

Impact on livestock and fishery management

During the study period from June 2013 to December 2015, queries raised by the farmers increased along with the time as there was an increase in the number of queries from 178 (15.88%) during 2013 to 529 (47.19%) in 2015. The farmers are getting solutions on various domains of livestock production and management. The numbers of queries raised by the farmers were increasing as the farmers started to gain the benefits through advisories provided by the innovation. The innovation has involved the state line department, media like newspaper, All India Radio and Doordarshan, T.V. etc. The innovation is on the way to make it sustainable by involving youth from each villages and creating youth clubs. During impact assessment of m4agri NEI lab, it was observed that 19.72% of the respondents have been benefitted in animal husbandry from the agro-advisory service.

The tribal farmers of Meghalaya predominantly depend on animal husbandry and agriculture for their livelihood. Development of livestock management is directly related to the improvement of livelihoods and socio-economic status of the rural tribal farmers in the state. Therefore, an agro-advisory system has been launched in June, 2012 under the project "Development and Deployment of Mobile Based Agro-advisory System in North-East India (hereafter called m4agriNEI)" by the Central Agricultural University (CAU) at Barapani, Meghalaya. The system was started with the collaboration of Media Lab Asia, New Delhi and was funded by the DeITY (Department of Information and Technology) Government of India, New Delhi with an objective to empower the farmers by providing right information on right time through a mobile based agro-advisory system. This study covers the queries of agro-advisory lab registered farmers regarding the various aspects of animal husbandry management including poultry and fishery management for a period of 2.5 years i.e., from June, 2013 to December 2015.

A total of 5,256 queries were raised by agro-advisory lab registered farmers on various aspects of crop farming,

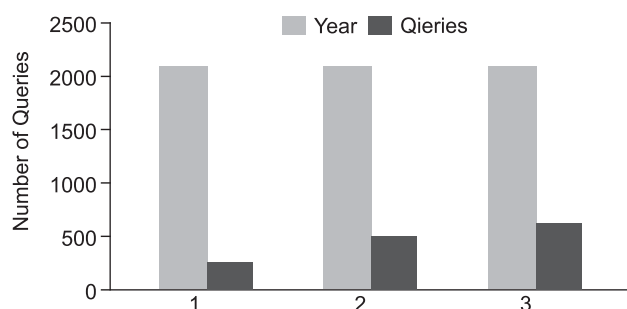


Fig. 2 Year wise Queries, 2013 to 2015.

Table 2. Solution given by experts on livestock/poultry health management

Query	Solution
Best time of weaning	The agro-advisory lab refers the farmers about the best time of weaning (Banerjee 1998) Calf : Just after birth/2-3 days of birth Kid/lamb : 14 weeks Piglets : 5-6 weeks Two types of weaning: • Partial weaning- Removal of the piglets at different time periods in parts. • Complete weaning- Removal of all the piglets at a time.
Age of piglet/calf castration	The agro-advisory lab refers the farmers about the age of castration (Banerjee 1998) Bull : 8-10 weeks Kid : 2-4 weeks Lamb : 2 weeks Piglet : 4-6 weeks
Malnutrition	The agro-advisory lab refers the farmers to feed the affected livestock with 1. Deworming using Anthelmintic like Albendazole, Fenbendazole. 2. Concentrate ration 3. Vitamin supplements 4. Mineral mixture
Preventive measures for Ranikhet disease	F-1/ Lasota 1 drop/chick at nostril or eye at 4-7 and 35 days old. Again, R ₂ B strain killed vaccine 0.5 ml/chick at S/C or Intra muscular after 56-70 days old.
Diarrhoea	The agro-advisory lab refers the farmers to provide the affected livestock with 1. Specific antibiotic like Furazolidone, Neomycin, Streptomycin, and Enrofloxacin. 2. Fluid therapy with sodium chloride solution for rehydration
Skin infection	The agro-advisory lab refers the farmers to provide the affected livestock with 1. In case of skin lesion caused by external parasites, Ivermectin can be administered to the affected pigs @ 0.3 mg/kg body weight. 2. Various antiseptic, antifungal ointments can be applied externally on the affected areas

Table 3. Solution given by experts on livestock breeding management

Query	Solution																									
Age of puberty/sexual maturity/cycle length	The agro-advisory lab refers the farmers about the average age of puberty/sexual maturity <table border="1"> <thead> <tr> <th>Species</th> <th>Female (months)</th> <th>Male (months)</th> <th>(Recommended age to breed (months)</th> <th>Cycle length (days)</th> </tr> </thead> <tbody> <tr> <td>Bovine</td> <td>11 (7-18)</td> <td>11 (9-24)</td> <td>15</td> <td>20-22</td> </tr> <tr> <td>Ovine</td> <td>7 (6-9)</td> <td>7 (4-14)</td> <td>8</td> <td>21</td> </tr> <tr> <td>Caprine</td> <td>7 (6-9)</td> <td>7 (4-14)</td> <td>8</td> <td>16-17</td> </tr> <tr> <td>Porcine</td> <td>7 (5-8)</td> <td>9 (7-11)</td> <td>9</td> <td>19-21</td> </tr> </tbody> </table>	Species	Female (months)	Male (months)	(Recommended age to breed (months)	Cycle length (days)	Bovine	11 (7-18)	11 (9-24)	15	20-22	Ovine	7 (6-9)	7 (4-14)	8	21	Caprine	7 (6-9)	7 (4-14)	8	16-17	Porcine	7 (5-8)	9 (7-11)	9	19-21
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Heat detection/Artificial insemination in pig/Time of breeding	The agro-advisory lab refers the farmers about heat detection of different livestock <ul style="list-style-type: none"> • Female become nervous and easily disturbed. • Rigidity in response to pressure on the back. • Standing for mounting. • Increased vocalisation. • Erect ears. • Swollen and reddened vulva. • Alert attitude. • Decreased appetite. The agro-advisory lab refers to the Animal Production Division, ICAR-NEH, Umiam for Artificial insemination. The time of mating/artificial insemination Cow/Buffalo : After 10-12 hours of estrus Goat : After 24 hours of estrus																									

(contd...)

(concluded table 3...)

Query	Solution
Anestrus	<p>Sheep : After 12–18 hours of estrus Pig : On second day of estrus</p> <p>The agro-advisory lab refers the farmers about delayed puberty in gilts or post-weaning anestrus in sows</p> <ul style="list-style-type: none"> • provide nutritious clean feed • injection of combination of pregnant mares' serum gonadotrophin (PMSG) with human chorionic gonadotrophin (hCG) (Dziuk and Dhindsa 1968)
Pregnancy diagnosis/Gestation period of livestock	<p>The agro-advisory lab refers the farmers about the signs and symptoms of pregnancy (Banerjee 1998)</p> <ul style="list-style-type: none"> • Cessation of estrus • The animal concerned tends to become sluggish in temperament and more tractable. • The animal has a tendency to grow fat. • Increase in body weight of the animal at the last half of pregnancy. • Increase in the volume of the abdomen at a later stage of pregnancy. • Mammary gland will become firm, enlarged and glossy, teats take a waxy appearance. <p>Length of livestock gestation period</p> <p>Cow/Buffalo : 280/310 days Goat : 150 days Sheep : 148 days Pig : 115 days</p>
Management of pregnant sow	<p>The agro-advisory lab refers the farmers about the management of pregnant sow</p> <ul style="list-style-type: none"> • Pregnant sow should be shifted to a clean farrowing house before 3 weeks of farrowing. • Clean and dry bedding material preferably of dry paddy straw/hay has to be provided in the pen. • The pregnant animal should be fed individually. • Fed <i>ad-libitum</i>. • Feed lightly with bulky laxative feed immediately before and after farrowing to prevent the occurrence of constipation as this may cause abortion during pregnancy or expulsion of genital organs immediately after farrowing. • Plenty of greens should be provided. • Feed allowance may be calculated as 2.5–3 kg/100 kg body weight plus at the rate of 0.2 kg feed per piglet with the sow. • Make sure that there is a good supply of fresh water all over the time period.
Abortion	<p>The agro-advisory lab refers the farmers to screen the animals regularly against abortion causing agents</p> <ul style="list-style-type: none"> • Separate positive animals from the herd and dispose aborted materials properly.
Signs and symptoms of parturition	<p>The agro-advisory lab refers the farmers about the signs and symptoms of parturition (Banerjee 1998)</p> <ul style="list-style-type: none"> • Swelling of udder, a clear waxy fluid material will ooze from the teats or may be expelled by pressure of the hand. • Entire genital organs will become swollen and look reddish. • Clear, straw coloured stringy mucus will be secreted, which usually soils the tail and hind quarters. • Dilation of cervix. • After 1–3 h of labour pain the water bag will appear at vulva. • Expulsion of foetus.
Number of piglets after parturition	<p>The agro-advisory lab refers the farmers that numbers of piglets depend on the breeds of pigs. It may vary from 6 to 18.</p>
Prevention of crushing of piglets by sow	<p>The agro-advisory lab refers the farmers to construct a guard rail around the farrowed pen. The rail should be raised 8–10 inches from the floor and 8–12 inches from the wall (Banerjee 1998)</p>

Table 4. Solution given by experts on housing management

Query	Solution		
Housing management	The agro-advisory lab refers the farmers about the floor space requirements for different categories of pig		
Category	Covered area/pig (sq.ft)	Open area/pig (sq.ft)	
Weaner	10–15	15–20	
Grower	12–20	20–30	
Dry sow	20–30	30–50	
Lactating sow	70–100	70–100	
Boar	35–50	50–70	

Table 5. Solution given by experts on training, source and schemes of livestock

Query	Solution
Animal husbandry training	The agro-advisory lab organised training programme on farmers' request or the agro-advisory lab refers the farmers to submit an application to the Director Cell, ICAR-NEH, Umiam for attending training.
Source of livestock/poultry	The agro-advisory lab refers the farmers to personally visit the Animal Husbandry Division, ICAR-NEH, Umiam or private/state farm for purchasing livestock/poultry for their farm.
Animal husbandry scheme	The agro-advisory lab refers the farmers to visit the nearest State Animal Husbandry Department.

animal husbandry and fishery of which 1,087 been received on animal husbandry sector and 34 on fishery sector. During analysis of farmers' queries and solution on animal husbandry including fishery, most frequently asked questions were on livestock/poultry health management (35.95%) viz. malnutrition in pig (9.10%), deworming in pig/goat (7.58%), diarrhoea in pig/goat (6.60%), Ranikhet disease (6.16%), skin infection in pig/calf (4.10%), best time of weaning/partial/complete weaning (1.96%), age of piglet/calf castration (0.45%), that followed by animal husbandry training (17.66%), schemes (11.15%) on pig (5.62%) and poultry (5.53%), source (10.70%) of poultry chicks (5.80%) and piglets (4.90%), breeding management (10.44%) viz. artificial insemination in pig (2.49%), age of puberty/sexual maturity/heat detection/cycle length/anestrus (2.32%), signs and symptoms of parturition/number of piglets after parturition (2.14%), pregnancy diagnosis/gestation period (1.60%), management of pregnant sow (0.98%), prevention of crushing of piglets

Table 6. Solution given by experts on fishery management

Query	Solution
Availability of fish fingerlings	The agro-advisory lab refers the farmers to visit the Meghalaya State Fisheries, Research and Training Institute, Meghalaya
Availability of fishery scheme	The agro-advisory lab refers the farmers to visit the Fishery Department, Nongpoh, Meghalaya.

Table 7. Solution given by experts on other queries

Query	Solution
Others (cough, shivering in pig, mastitis in cow, haematuria in pig, hernia in piglets, accident cases etc.)	The agro-advisory lab refers the farmers to consult the local veterinary doctors.

by sow (0.62%), abortion (0.27%), on fishery, most commonly farmers asked about the source of fingerlings (3.03%) and housing management of pig (1.87%). The query other (9.19%) included the queries regarding fowl pox, pig constipation, cough, fever in livestock, livestock accident cases viz. fracture, dog bite etc. that were raised by the farmers.

As livestock is a main source of livelihood for tribal of Meghalaya, the agro-advisory lab is playing its pivot role to render its advisory in respect to livestock. So far the lab has provided 1,121 numbers of solutions through mobile and it has impacted the income and livelihood through saving of time to access the right information at right time. Hence, to make this initiative as sustainable as well as more adoptable the state extension machinery should come forward especially the veterinary department of the state. Further, such type of programme needs to replicate in the state of Meghalaya to cover more number of livestock farmers for their upliftment.

ACKNOWLEDGEMENT

The authors are highly grateful to the Department of Electronics and Information Technology (DeitY), MCIT, GoI, New Delhi for funding the project entitled "Development and Deployment of Mobile Based Agro-Advisory System in North-East India (m4agriNEI)" from which this paper has been drawn. The authors are also very much thankful to the competent authority of Central Agricultural University, Imphal to make this research collaboration with Media Lab Asia, New Delhi. The authors also wish thank to the Dean, College of Post Graduate Studies to provide the facility to establish the Agro-Advisory Laboratory in the college. At last but not least thanks goes to all the research staff and project research team for supporting directly or indirectly to improve the quality of this research article.

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