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Revitalizing Livelihoods of Tsunami Victims in Aceh, Indonesia, by Investing on Flood Risk Sensitive Livestock Development

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Abstract

The magnitude of the human, livestock, and material devastations of the December 2004 Tsunami is massive requiring global efforts to deal with the short and long-term consequences. The densely populated Aceh province of Indonesia was the most affected area with nearly 250,000 people confirmed dead or missing. Practically everyone of the nearly 4 million inhabitants of the province lost family members and livelihood bases. This paper presents a conceptual framework to invigorate the devastated livelihoods in Aceh with an investment on risk-sensitive and quick-return livestock production system. In the short-term immediate needs of the survivors such as building confidence and enterprise establishment are on focus whereas in the medium- to long-term development of agricultural production systems would be the main focus. With a strong argument that livestock are among the few options for fast recovery, the framework outlines the working principles, essential components, and characteristic features of risk sensitive livestock development. The framework presents an indicative plan of action ranging from introducing specific husbandry practices to reestablishing the population through local breeds of the favorite species adapted to the area. A prerequisite for success of this master plan would be the setup of a long-term partnership programmes, which would enable the communities to count on the global scientific community for assistance.

Introduction

December 26, 2004 ushered one of the unforgettable natural disasters humankind ever experienced. The magnitude of natural disasters represents the intersection of two sets: natural and population. As the population continues to grow, so does the area of intersection, leading to costlier and deadlier disasters (Barton and Dishenko, 1997). The risk of a Tsunami event is unavoidable as the geological process of land slide and earth quake are indispensable forces in nature. We define risk in this context as exposure to unfavorable consequences of decisions made under uncertainty of natural disaster. Geophysical studies have long been trying to model and estimate the probability with which Tsunamis might occur (Synolakis et al., 1997). Experiences in Japan and USA show that Tsunami risk can be estimated with considerable level of precision (Legg et al., 2003; Legg and Borrero, 2001).

Risk management in a complex structure of livelihoods needs careful prioritization and focused interventions. Livestock are important because of the following reasons:

- livestock production and marketing have been important activities of the people in the Aceh area;
- the Tsunami affected the physical and chemical properties of the soil that farming activities are not possible in the short run;
- the nature of animals, especially small ones, makes the enterprise fit for flood risk sensitive plan as evacuation is a possibility;
- livestock production including fishery is relatively fast and easy enterprise to establish;
- livestock allow the poor to gain private benefit from common-property resources independent of private holdings, and utilize feed that has few alternative uses (Beck, 1995);
- livestock are one of the few natural capital assets owned by poor households and can be crucial in maintaining household survival in times of crises, and
- livestock management is flexible enough to accommodate risk mitigation procedures and processes.

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This paper presents a framework with which sustainable livelihoods can be enhanced in the case of Aceh of Sumatra in Indonesia. We argue that there is the possibility of such a disaster in the future and so Tsunami is worth considering a serious risk.

Agriculture in Aceh Province

Aceh Province, known as Nanggro Aceh Darussalam, lies on the tip of Sumatra island with an area of 57,390 km^2 and human population of about 4 million. Aceh has been virtually in isolation for years. Therefore, it is less developed compared with the other provinces in Indonesia. The number of people living below poverty line was about 30%, far below the national average of 17% (BPS, 2003). In August 2001, the Indonesian government granted a special autonomy status to Aceh province. Since then, Aceh receives a greater share of income from its natural resources, mainly gas.

Pre-Tsunami situation

Extensive and subsistence oriented crop and livestock production activities are the principal features of the agricultural systems in Aceh. Farm size ranges from 0.2 to 0.68 hectares per household. Rice is the staple food crop. Small holding livestock production involves beef cattle, water buffaloes, poultry, goats and sheep; the smaller animal species are very important components of the agricultural system in the whole Indonesia (Sodiq, 2004). Agriculture used to contribute a third of the regional domestic product, ranking next to gas and oil sector. Nearly 48% of the population of the province was also reported to be dependent on agriculture for its livelihoods (BPS, 2003).

The most important economic activity before the Tsunami of the Aceh community was fishery and aquaculture. With regard to aquaculture a total of 36,597 hectares of aquaculture production areas in 11 districts of Aceh province were recorded prior to the Tsunami. These areas were mostly used for culturing finfish and crustaceans such as shrimp, crab, milkfish, sea bass, etc. (http://ftp.fao.org [24.01.2005]).

Post-Tsunami Situation

The destruction caused by the Tsunami was paramount in the west coast of Aceh province in which high tides entered inland up to 2 km compared to the 1 km from the shoreline in east coast. In some parts of the province, such as Banda Aceh, the seawater inundated up to 4 km from the shoreline. The mud of the Tsunami brought pollution plus many kinds of poisonous materials that are harmful to living organisms. Several water samples taken from effected areas indicated that concentration of ammonia (NH_3) sharply increased from 1.5 mg/liter to 13 mg/liter. In addition, the amount of E. *coli* also increased from 1000/100 ml of normal condition to 1104-9104/100 ml. Other materials such as Sulfides, Fenol and COD also went up compared to the condition before Tsunami (Bappenas, 2005a). A survey conducted indicated that the level of salinity in effected areas was 1000 ppm, while most crops are only tolerant up to the level of around 25 ppm (Bappenas, 2005a). It can be predicted, however, that tropical rainfall will have a positive effect on reduction of salinity with in few years.

Bappenas (2005b) estimated that total damages and losses in agricultural sector due to Tsunami were around US$ 2.2 billion. Moreover, about 300,000 people in the agriculture are already unemployed and/or underemployed. This accounts for 50% of the total number people who lost their jobs because of Tsunami (Bappenas, 2005a). A pictorial comparison of pre- and post-Tsunami Aceh's coastal areas can be made from satellite pictures given below (Figure 1 and 2).

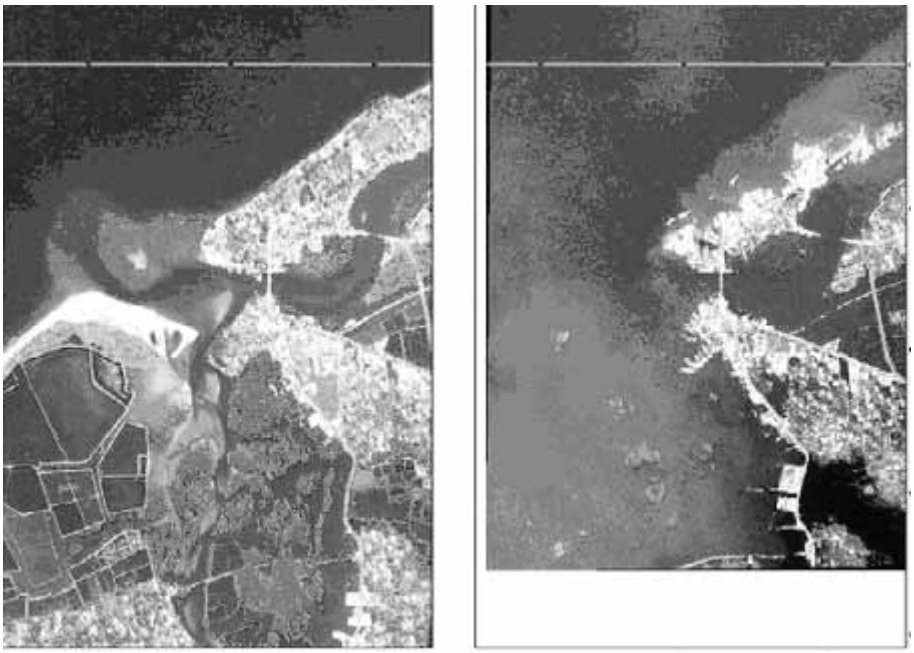

Figure 1 : Comparison of the coastal zone before and after the Tsunami.
(Source: **http://unosat.web.cern.ch/** [24.02.2005])

Figure 2: Comparison of agricultural land of Banda Aceh before and after the Tsunami.
(Source: **http://unosat.web.cern.ch/** [24.02.2005])

Revitalizing livelihoods after disasters: A conceptual framework

People of Aceh are dependent on aid from international organizations. The communities of Aceh would have to restart their own economic activities and repossess their economic independence. The empowerment of the communities to sustain the livelihoods in a way like or better of pre-Tsunami disaster is the challenge ahead. The urgency with which action has to be taken is also an important dimension.

The effort of Aceh people to re-establish their livelihoods can be reinforced through different approaches and mechanisms. Experiences in places like Bangladesh show that communities have their own ways of coping with such disasters and these knowledge should be the basis for disaster

mitigation efforts (Chakma, 2003). Personal observations were made to find out the needs of the affected community in Aceh over time and the following were identified as important.

Short-term needs
To provide a basis for reactivation of settlement and livelihoods in the affected areas of Aceh, a network among survivors is vital. A network can help the people, with the supervision of qualified technicians, in the following aspects:

- Psychological counseling (mainly de-traumatization);
- Empowerment and confidence building;
- Sharing of skills, which are required to re-establish livelihoods (e.g. fishing); and
- Develop and prioritize an action plan.

To avoid the dependency syndrome that normally follows massive aid programs, people should be enabled as fast as possible to support their own livelihood. The following steps can be taken to support the empowerment:

- Identification of enterprises the people are willing to work on;
- Identification of enterprises with quick returns (fisheries, small ruminants etc);
- Provision of farm, fishery and aquaculture facilities; and
- Provision of training for survivors to acquaint them with the enterprises.

Medium-term needs

- Re-stocking with common and indigenous livestock. FAO (1999) stresses the need to restocking with indigenous breeds of animals in the process of rebuilding livelihoods and this was found to be in line with the interest of the local stakeholders (Noor, personal communication).
- Identify and conserve livestock raised by pristine communities.
- Revitalizing the livestock marketing system.
- Rebuilding infrastructure for information exchange and market functions in order to make the livestock production system rewarding on a continuous basis.
- Develop a reliable early warning system on Tsunami of any magnitude based on previous observations.

Indicative plan
This section summarizes a conceptual framework to invigorate the devastated livelihoods in Aceh with an investment on risk-sensitive and quick-return livestock production system. With a strong argument that livestock are among the few options for fast recovery, the framework outlines the working principles, essential components, and characteristic features of risk sensitive livestock development. A prerequisite for success of this plan would be the set up of a long-term partnership programme, which would enable the communities to count on the global scientific community for assistance.

The immediate needs of the survivors are reinitiation of livelihood support systems and the potential entry points to work with and for the Tsunami survivors in Aceh. Specifically related to livestock, the primary issue is collecting, organizing, analyzing, and interpretation of data and information on: the number of people who are interested in livestock activities, the types of livestock related enterprises survivors are interested in, the capabilities of interested survivors to start the livestock enterprises, the challenges prevailing to engage in livestock related activities, and opportunities to enhance the capacity to start a dependable livestock enterprise.

Institutional issues
By institutional issues we are referring to the beneficiaries, intermediary stakeholders and technical supervisors. The main tool in this regard is the network among survivors to be established by the survivors, serving the survivors, and linked with key stakeholders. Addressing the survivors and their needs will also be much easier if they are organized. So, voluntary organization of the survivors should be acted up on at the early stages of implementing this plan. Such mechanisms effectively empower the survivors for resource access and allocation, decision making, and income sharing. The community organizations would be dependable channels through which information on marketing and

environmental issues is transferred. Provisions of equipment for farming, fishery and aquaculture can also be done effectively and efficiently only if these organizations are formed and formed voluntarily. This entails careful and participatory awareness creation and mobilization of the community.

Representatives of the community to be identified preferably by the organization should be able to set the rules of conduct with the assistance of the important stakeholders and the lead technical supervisors. The rules of conduct need to be based on the social norms and values of the Aceh people.

Restocking and service delivery
In addition to, rebuilding farm facilities and re-stocking of animals, training programmes, slaughtering facilities, animal health and marketing are important issues that have to be dealt with urgently. Restocking should include well adapted and well known breeds. For instance, for beef production the Aceh cattle (Figure 3), being one of the four indigenous breeds of Indonesia, is highly adapted to the tropical climate of Aceh and to the local farming system (Allen and Na-Chiangmai, 2002).

Figure 3. Aceh Cattle roaming in the villages in post Tsunami Aceh

Market and environmental information systems
Sustainable development of the livestock production in the post-Tsunami Aceh cannot be achieved without a well developed livestock marketing system. A well developed marketing system is characterized, *inter alia*, by timely provision of accurate and adequate market information, clearly defined quality standards for commodities, properly functioning marketing infrastructure and security of the bargaining power of both sellers and buyers. Assuming that one or more of the various governmental and non-governmental organizations working in the area will have a lot to do with the marketing development, this plan focuses on the market information system. For this plan, market information system (MIS) implies the coordinated effort of marketers and concerned institutions to collect, organize, analyze, interpret and disseminate data and information related to the demand, supply, price and market infrastructure focusing on livestock.

The following would be the important features of the MIS:

- Identifying the important participants in livestock marketing.
- Assessing the demand of livestock products and by-products.
- Estimating the potential supply of livestock products and by-products.
- Examining how the price of livestock products and by products is determined.
- Determining the marketing margins for the participants in livestock marketing.
- Documenting and reporting the status of market functions, such as storage, quality control and standardization.
- Identifying the constraints in the marketing system and suggesting alternative solutions.
- Transferring information timely and continuously to the participants with particular priority to livestock raisers.

This plan also suggests an environmental information system (EIS) as part of the long-term development of Aceh. This EIS is meant to pave the way for appropriate use of the information to be generated by the Tsunami Early Warning System (TEWS) to be established on the Indian Ocean in two years from now. The EIS, based on the information from TEWS, would help in working out a

Tsunami risk sensitive livestock production system. Therefore, the Aceh community would have an enterprise that is flexible and sensitive enough to buffer their livelihoods from Tsunami floods.

Appraising the investment

The investment to be made based on the indicative plan summarized in this paper need to be appraised with risk considerations. Let's denote the different states of nature implying the types of Tsunami that can happen by θ_γ; therefore, the worth of the project (R) is the function of costs (C), benefits (B), interest rate (i) and θ_γ : R = f(C, B, i, θ_γ). Under certainty or fully predictable conditions, the common measures of project worth, i.e., net present value and internal rate of return, are computed with the following equations:

$$\text{NPV} = \sum_{t=1}^{n} \frac{B_t - C_t}{(1+i)^t} \qquad \text{and} \qquad \text{IRR} = \sum_{t=1}^{n} \frac{B_t - C_t}{(1+i)^t} = 0$$

Where n = number of years.
B_t = Benefit in year t (t = 1,…, n).
C_t = Cost in year t (t = 1,…, n).
i = interest rate (discounting factor).

The fact that the risk of natural disasters, including Tsunami, is increasing necessitates a measure that incorporates the likelihood of the disasters while comparing sets of activities. With the assumption that timely and precise information would be available from the TEWS, the evaluation of the activities of the plan can be done as follows.

Let $P(\theta\gamma)$ = probability of occurrence of γ state of nature, e.g., type of Tsunami ($\gamma = 1,\ldots,k$),
$B_{t(\theta\gamma)}$= Benefit at year t under γ state of nature.
$C_{t(\theta\gamma)}$= Cost at year t under γ state of nature

$$\sum_{t=1}^{n}\sum_{\gamma=1}^{k} \frac{P(\theta\gamma)\left[B_{t(\theta\gamma)} - C_{t(\theta\gamma)}\right]}{(1+i)^t} \quad \text{and} \quad \text{IRR} = \sum_{t=1}^{n}\sum_{\gamma=1}^{k} \frac{P(\theta\gamma)\left[B_{t(\theta\gamma)} - C_{t(\theta\gamma)}\right]}{(1+i)^t} = 0$$

The decisions would be in favour of the activities of the plan if the NPV is positive and the internal rate of return is greater than the market cost of capital usually measured by the current interest rate. Some other means of evaluating the worth of the activities in this suggested plan can also be applied if technical and material inputs are easily available in the area. Such tools include mathematical programming (Hazell and Norton, 1986) and stochastic dominance analysis (Hardaker et al., 1997).

As a final point, an appeal is made for the animal production scientists to take into consideration the clear fact that livestock are one of the few realistic options to get life in rural Aceh back on track even under the potential risk of future Tsunami. This potential of livestock should be exploited in a sustainable and replicable manner so that people living under uncertainty and the associated risk of flooding disasters would be able to depend on their natural asset – livestock. An academic and developmental focus should therefore be made to operationally pursue the options and their viabilities in terms of availing livestock based enterprises to revitalize livelihoods after natural shocks.

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Online Resources

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http://www.fao.org/documents/show_cdr.asp?url_file=/DOCREP/004/AB986E/ab986e0n.htm