How Can We Perceive Social Vulnerability: Rethink from a Case Study on the Impact of Infectious Disease on Agricultural Production in Zambia

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I. Introduction

The importance of vulnerability as a notion to comprehend the cause of famine and poverty has been widely acknowledged. In spite of difficulty to define the meaning of it, the vulnerability has become one of indispensable notions that is necessary to discuss about eradication of poverty, self-help development, formation of social capital, self-governing institutions, sustainable development and etc. The emerging concept of 'social resilience' has also strong connection with vulnerability, because most of social resilience has to do with reduction of vulnerability of society. The concept of social resilience means the process of recovery from any destructive conditions that were brought in society. Social resilience has relation to both natural disaster and socio-political upheaval. The paradigm shift type of social change is in the scope of resilience study. But social resilience relate to paradigm shift should be discussed completely different from that without paradigm shift. In this paper I will be handled only the case of non-paradigm-shift type of social resilience[1].

As Blaikie et al. (1994) noted to define vulnerability is not easy. They showed an example about the impact of new road on the vulnerability of previously isolated rural communities. Saying that the new road may help to reduce the vulnerability of the community in times of drought but at the same time it may serve to increase vulnerability through evacuation of able-bodied youth out of the community that caused decrease in production (Blaikie et al. 1994; 16).

I want to discuss in this paper first about complexity of vulnerability, and then to propose some significant points to be noticed when we discuss about vulnerability. Some definitions have been proposed; Chambers (1989) defines vulnerability as the exposure to contingencies and stress, and difficulty coping with them. And he suggests that there are three co-ordinates of vulnerability; the risk of exposure to crisis, stress and shocks, the risk of inadequate capacities to cope with stress crises and shocks, and the risk of severe consequences of and from crisis, risk and shocks. Blaikie et al. (1994) have defined from the natural phenomena point of view that vulnerability is the characteristics of a person or group in terms

[1] The restoration of 'normality' does not always mean reduction of vulnerability. It may sometimes strengthen a structure that may reinforce deep-rooted causes of chronic increase of social vulnerability (Blaikie et al. 1994; 196).

of their capacity to anticipate, cope with, resist, and recover from the impact of natural hazard.

There still remain some points to be discussed and examined for definition, however it is not aimed at refining the definition in this paper but tried to note some significant points relevant to the further discussion on vulnerability. I will take an example based on my field study done in Zambia about the impact of excessive death of people on the vulnerability of individuals and of families.

II. HIV/AIDS study and social vulnerability

There are no doubt that prevalence of HIV/AIDS has strong impact on people's daily life and that has increased vulnerability of some of individuals and families. The importance thing is to anatomize the process of increasing vulnerability and to discern the variety of nature of vulnerability. Most of HIV/AIDS studies do not directly refer to social vulnerability, however most of them have something to do with it more or less.

Many studies have done to assess the direct and serious effects of HIV/AIDS from medical, nutritional, and economic points of view. Among them study on effect indirect and slow are relatively scarce, as these effects are very complex and difficult to discern. Barnett and Whiteside (2002, 161) suggested that the impact of an infectious disease should be seen as a continuum between an acute shock and slow, profound changes. We should therefore pay more attention to the indirect and slow effects of diseases in addition to the direct impact that is made. For this purpose it is necessary to conduct a long-term field study.

The effects of diseases that emerge slowly and indirectly occur at different community levels, e.g., at the level of an individual household, a whole community, or an entire nation. Because such effects affect different societies in different ways, we can only understand them in the context of certain social settings. Illness and death affect not only the health of individuals but also the well being of each household. In rural societies where agricultural production is the principal economic activity, the impact of disease on agricultural production can constitute a critical problem. In this paper it is aimed to evaluate the effects of novel infectious disease on agricultural production.

Special attention is paid to the dispersion of vulnerability through a mutual help system. In the context of agricultural production, the mutual help system normally functions to assist individual farmers by mitigating the effects of labor or equipment shortages may be jeopardized by unprecedented high rates of people's death. And the high rate of death is relates to prevalence of infectious disease.

This study was conducted in Zambia in a rural village located about 90 km north of the capital city of Lusaka (Figure 1).

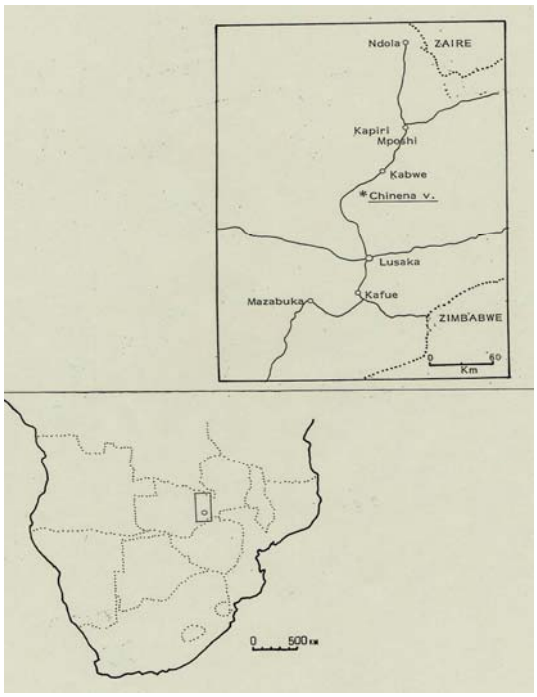

Fig. 1: Location of study area

III. Prevalence of infectious disease

I have investigated changes in the agricultural production system in the study village (referred to hereafter as village "C") since 1993 (Shimada 1995, 2000). Agricultural production in this village has changed remarkably and has been subject to the influence of rapid socio-economic changes in Zambia. However, only recently did realize the serious impact infectious disease has had on the village. Several households have shown an extraordinarily high death rate among adults, although this high death rate has not yet become prevalent across the whole village. However, when these few cases are examined more closely, it is apparent that a high death rate within households could become a serious concern to farming.

The intent of this study was not to identify the prevalence of HIV/AIDS in the village, although I consulted one medical doctor on the possible presence of HIV/AIDS in the village. She visited the village twice in February 2002 to conduct interviews. Although she was reluctant to positively identify the disease without a formal HIV test, she conceded that there was high probability of HIV/AIDS prevalence in some of the interviewed households[2]. The household described in this paper, as a case study with unprecedented high death rates was one of those families. In this study, I assess the impact of high rates of illness and death on agricultural production.

[2] The World Organization (WHO) has estimated that about 28.1 million people in Sub-Saharan Africa are infected with HIV/AIDS. WHO has also estimated that in 16 African countries, at least 10% of people aged 15-49 are infected; in Southern Africa, at least 20% of the population in this age group are infected (WHO 2001, 16); AIDS has thus become the biggest threat to people in southern Africa.

IV. Agricultural production: Two types of farming practices

Village C was established in the late 1960s and its population increased rapidly for a number of reasons. The first head of the village, who died in 1981, welcomed new people into the community, regardless of their ethnic origin. Wetland (*dambo*) cultivation also attracted new settlers to the village, and the introduction of the Structural Adjustment Program in 1983 accelerated this movement.

Figure 2 illustrates the increase in the number of households that cultivated *dambo* farms. This figure reflects the increase in the total number of households in the village, as almost all the

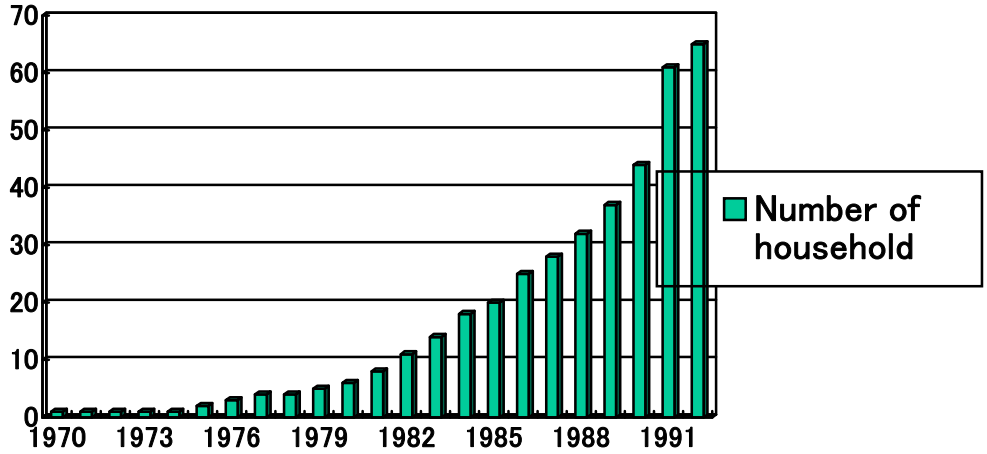

Fig. 2: Population increase in the village C

people who had migrated to the village before 1991 were able to access *dambo* land. In total, village C consisted of about 120 households in 1998[3]; at this time, most farmers cultivated *dambo* land.

This study was based on an intensive investigation of fourteen households that were located near *dambo* K, one of most fertile *dambos* in the village (Figure 3). Of the four *dambos* in the village that were developed for cultivation in 1991, d*ambo* K was the first. Some households migrated from Zimbabwe to the vicinity of the *dambo*. One of these households was the first one to initiate *dambo* cultivation in the village, and as Figure 2 shows, *dambo* cultivation gained popularity in the 1980s.

Two types of farming take place in the village: upland maize production during the rainy season (December to April) and vegetable cultivation in the *dambo* during the dry season (Figure 4). For most farmers, upland maize production is the most important agricultural practice, as maize is a staple food. The cultivation of crops such as tomatoes, watermelons, and

[3] In 1993, there were about 110 households. Between 1992 and 1998, on average about five households left and seven households immigrated every year. (Kodamaya 2000, 129)

rape on *dambo* farms is a very important way in which cash income is generated. For some

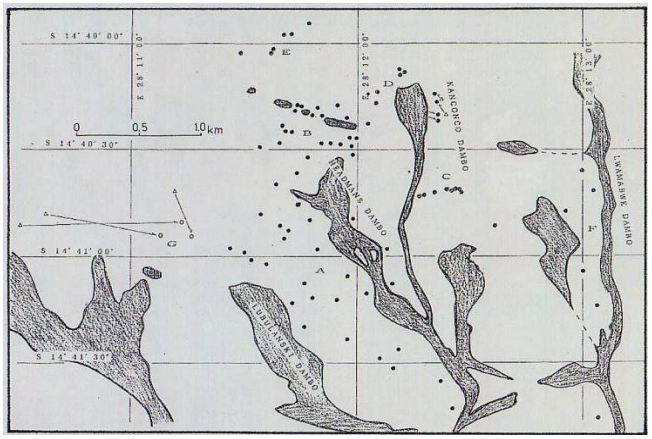

Fig. 3: Distribution of *dambos* in the village

Dambo	Dambo farm	Upland farm
	Tomato	Maize
	Water Melon	Tomato
	Rape	Water Melon
	Sweet Corn	Cotton

Fig. 4: Schematic land use in the *dambo* and upland

farmers, the estimated amount of production from *dambo* farming has far exceeded that of upland cultivation (Table 1). These farmers have become more and more dependent upon *dambo* farming as a way of increasing their cash income and as a means of strengthening their economic base by diversifying their products.

The cultivation practices of these two agricultural systems are quite different.

Table 1: Estimated gross output of upland and *dambo* farms

(Upper row: January to August, 1993)

(Lower row: January to August 1994) 1000Kwatcha

Farmer	Upland farm			Dambo farm (a)			Total (b) [(a)/(b)]
	maize	tomato	water-melon	maize	tomato	water-melon	
1	66 82	32 96	- -	- -	180 280	- -	278[65] 458[61]
2	45 68	53 14	48 36	30 45	90 288	- -	266[45] 451[74]
3	90 30	20 20	- 5	- -	22 64	- 34	132[17] 153[64]
4	80 30	4 -	- -	- -	7 151	1 -	92[9] 181[83]
5	82 97	20 -	- -	- -	60 -	- -	162[37] 97[0]
6	50 60	32 128	6 -	- -	14 -	- -	102[14] 188[0]
7	n. a. 12	n.a. 18	n.a. 22	n.a. -	n.a. 32	n.a. 19	n.a. 103[50]

Maize production is calculated by the estimated number of bags (90kg) produced.

Other vegetable production is estimated by calculation as follows:

Tomato: [number of box] x [price per box]

Rape: [number of bundle] x [price per bundle]

Water Melon: [number of bag (90kg)] x [price per bundle]

The price of vegetable was so changeable that average price of each week was adopted in case farmers did not remember the real price. The weekly average price was calculated by reliable prices interviewed.

Individual households, each of which consists of a husband, wife/wives, and children, cultivate *Dambo* farms. Widows or divorced women with children sometimes cultivate *dambo* farms on their own. Mutual help in *dambo* cultivation from members outside the household is not common.

In contrast, upland cultivation of maize is carried out by a big farming unit, i.e., a cluster of households that consists, mainly, of an extended family. Many farmers cultivate tomatoes in upland farms, but maize is the mainstay crop in the fields. Tomato cultivation in

upland farms usually begins after the end of maize cultivation.

Maize production is still the most important activity for most villagers; however, the abolition of maize procurement in 1993 weakened the confidence of farmers in maize, and vegetable production on *dambo* farms has become increasingly important (Shimada 1995).

V. Group farming on upland fields

Both upland and *dambo* cultivation are affected by illness and death. However, because of differences in cultivation practices, the extent to which each type is affected by illness and death differs. Here, I outline group-farming practices in upland agriculture.

Groups that participate in upland cultivation vary in size. While individual households sometimes cultivate upland farms, the most common unit for upland cultivation is a cluster of households that typically make up an extended family. This is especially true for the Shona people, who migrated from Zimbabwe and settled near *dambo* K (Shimada 2002): an extended family forms a cluster of households that cultivate upland fields as a group.

All members of the group share the work involved in cultivating the upland farm. All plots that belong to adult male members of the group are cultivated in the order of seniority (age). Figure 5 shows a schematic rotation order. If the wife/wives of a deceased head of the family are alive, their plots will be cultivated first[4].

The nature of this group farming system is ambivalent. Although it provides labor, machinery, and seeds to those who lack these commodities, it also distributes risks unequally among the group members. Fields cultivated early in the rainy season have a higher probability of a good harvest than do those that are seeded later. Therefore, senior members have a better chance of a good harvest than junior members. Of course, this probability varies year by year because of irregular rainfall patterns, but villagers know by experience that planting early is better than planting late. Thus, the bigger the group, the higher is the risk of a failed production for junior members. Active junior members often become frustrated by delayed planting, which is one reason why big groups are susceptible to being dissolved into smaller groups. However, as long as members feel that the advantages outweigh the drawbacks, they will continue to farm in groups.

[4] Ja and He in Figure 8 are two widows left behind by the former head of the household. They are the mothers of the current head of the household, Jo.

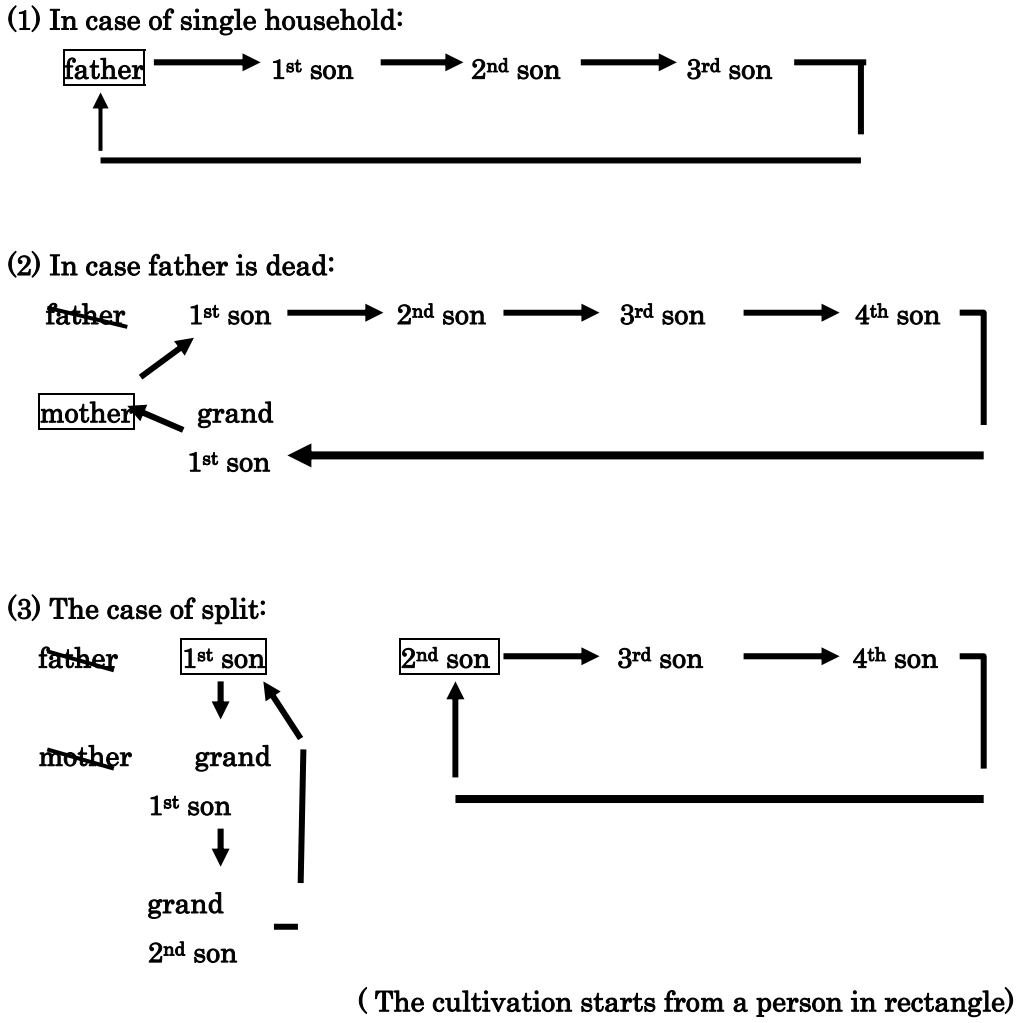

Fig. 5: Schematic order of cultivation in upland

Group dissolution usually follows the death of the head of a household or other senior member, although it may occur every time junior members demand it. The development of *dambo* cultivation, which is carried out by individual households, also influences the demand for dissolution.

VI. The importance of group cultivation and mutual help

Upland farming requires at least one plow and two mature cattle, as well as an adequate supply of maize seeds and, if possible, fertilizer. However, some farmers do not own these essentials. Figure 6 shows the number of cattle owned by each household in 1996, 1997, and 2000.

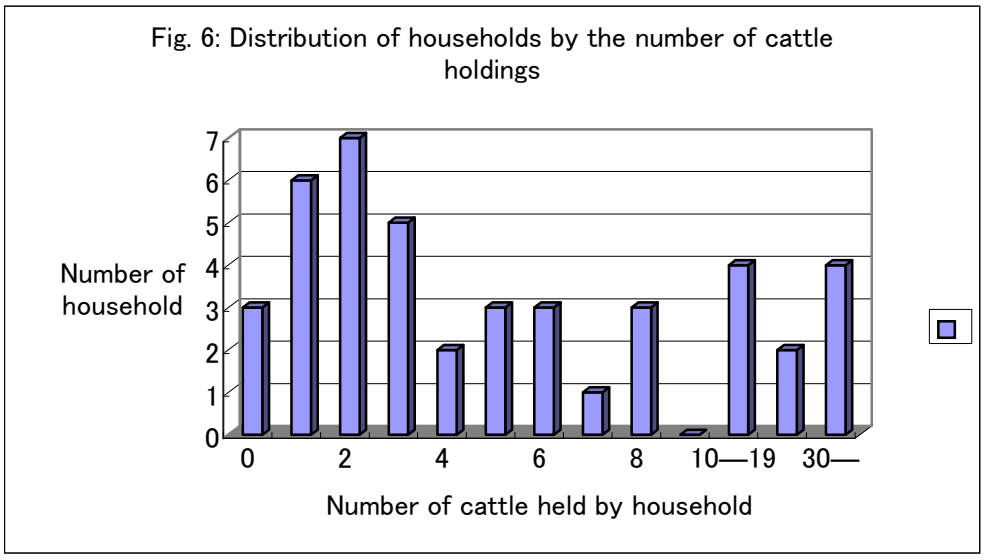

Fig. 6: Distribution of households by the number of cattle holdings
This shows the sum up of the results of study for fifteen households in 1996 and fourteen households in 1997 and 2000. In these three years, the study was conducted in August.

About 19% of households have fewer than two cattle and are therefore unable to cultivate their fields alone. At the time of the first rain, cattle for plowing are critical in upland cultivation, as the first planting must be initiated properly over a short period following the first rain.

In this respect, group cultivation functions as an important mutual help system. This system is particularly beneficial to widows, divorced women, and young couples who lack agricultural equipment and/or cattle. It also helps absent group members who have cattle and farmland in the village but who cannot return to the village in time for cultivation. In this system, plots of all members will be cultivated regardless of whether they are present at the time of cultivation. People who are ill also benefit from this system.

If a group owns more cattle and equipment than it requires, it will lend these commodities to other groups in need. Cattle and/or equipment are typically loaned in exchange for money or maize, and sometimes even for free (Table 2). Loans are based on good relationships among kin or friends. Table 3 shows such interchanges observed during the 2000/01 rainy season in xx families.

Table 2: Work without charge

Service given		Relations
Lend oxen and plow	8 days	to cousin
Lend oxen and a cart	9 days	to relative
Lend a ox	3 days	to friend
Lend a cart	4 days	to brother
Lend a farmland	for nursery	to friend
Childcare	n. a.	to friend
Lend a pumping machine	n. a.	to friend
Plowing	n. a.	to relative
Mutual work	3 days	to friend

(Interviewed for the year of 2000/2001)

Table 3: Contract work with payment

(Interviewed for the year of 2000/2001)

Contract work	goods received	Contract work	money received
Plowing (1 day)	maize(2 bags)	Plowing (1 day)	25,000K
Plowing (3 days)	maize(2 bags)	Plowing (2 days)	30,000K
Plowing (2 days)	maize(1 bag)	Plowing (45 yards)	45,000K
Plowing (3 days)	maize(1 bag)	Plowing (30 yards)	30,000K
Plowing (2 days)	maize(10 cans)	Plowing (50 yards)	50,000K
Plowing (2 days)	maize(10 cans)	Plowing (42 yards)	42,000K
Plowing (4 days)	maize(2 bag s)	Plowing (2 days)	n. a.
Plowing (3 days)	maize(1 bag)	Plowing (1 day)	n.a.
Plowing (2 days)	maize(1 bag)	Plowing (5 days)	n. a.
Plowing (2 days)	maize(1 bag)	Plowing (2 days)	n. a.
Plowing(2 days)	maize(1 bag)	Plowing (1 day)	n. a.
Plowing (piece work)	maize(2 bags)	Repairing	70,000K
Block layer	maize(2 bags)	Repairing	45,000K
Get an advance100,000K	maize(4 bags)	Repairing	n. a.
Plowing (1 day)	fertilizer(1 bag)	Lend a cart(half day)	1000K x 30
Weeding(1day)	fertilizer(1 bag)	Lend a cart(half day)	1000K x 30
Weeding(2 days)	fertilizer(1 bag)	Lend a cart(half day)	500K x 50
		Lent two oxen (half day)	n. a.
		Lend two oxen(half day)	n. a.

Payments listed in the table will be procured some time later. In most cases, payments are made after the maize has been harvested, although it is quite common for debtors to leave their debts for months or even over a year.

Table 4 illustrates the case of a debt that remained unpaid for more than one year. This debt was incurred when several villagers received meat from a farmer in 1997. The farmer did not coerce his debtors to pay back their debt, because he knew he could reclaim it any time he desperately needed it. At the basis of this transaction lay a good human relationship between lender and debtor. A lender can reserve the right of claim for more serious cases and will claim seed maize or money when he truly needs them. While such transactions or free exchanges do

not guarantee an equivalent return to the creditor, they do contribute to increasing access to resources.

Table 4: Debt unpaid more than one year;

Name of Debtor	Pledged money or maize to pay
Mrs. Mu.	6500K
Mrs. C.	6000K
Mrs. Mn.	5000K
Mrs. Shi.	5000K
Mrs. Z.	1500K
Mr. Ti, Z.	2500K
Mr. Chi.	2 bags of Maize
Mr. Shi.	4 bags of Maize
Mr. Mu	3 bags of Maize
Mr. Wa.	9 bags of Maize
Mr. Sha.	2 bags of Maize
Mr. Nk.	1 bag of Maize
Mr. Mus.	3000K

(Mr. Ps slaughtered an ox in August 1997. These are debt unpaid for the meat in August 1998)

K: Kwacha (1 US$ was equivalent to 1400K)

A bag of Maize was about 30,000K

VII. High death rates and their impact on group farming

The death of an active adult results in the loss of industrious and productive human capital. Hospital charges, funeral payments, and extra-funerary expenditures impose a financial burden on the surviving group members. In addition, deaths influence agricultural production by affecting the group farming system. As discussed earlier, group farming and the mutual help system play an indispensable role in upland farming, but this role has begun to change for several reasons. One of the most recent and most serious reasons is an unexpectedly high death rate.

Figure 7 shows an example of successive deaths in an extended family. Five households in village C belonged to extended family S. These five households formed a farming group, of which J.S. was the most senior male member and therefore head of the group. This is one of the most serious cases observed in the village. Seven adults and four children have died since 1998. The death of an adult has a very serious impact on agricultural production over the short and long term, and as far as the impact on agricultural production is concerned, the death of an adult

is more serious than the death of a child. Some examples from the extended family of J. S. follow.

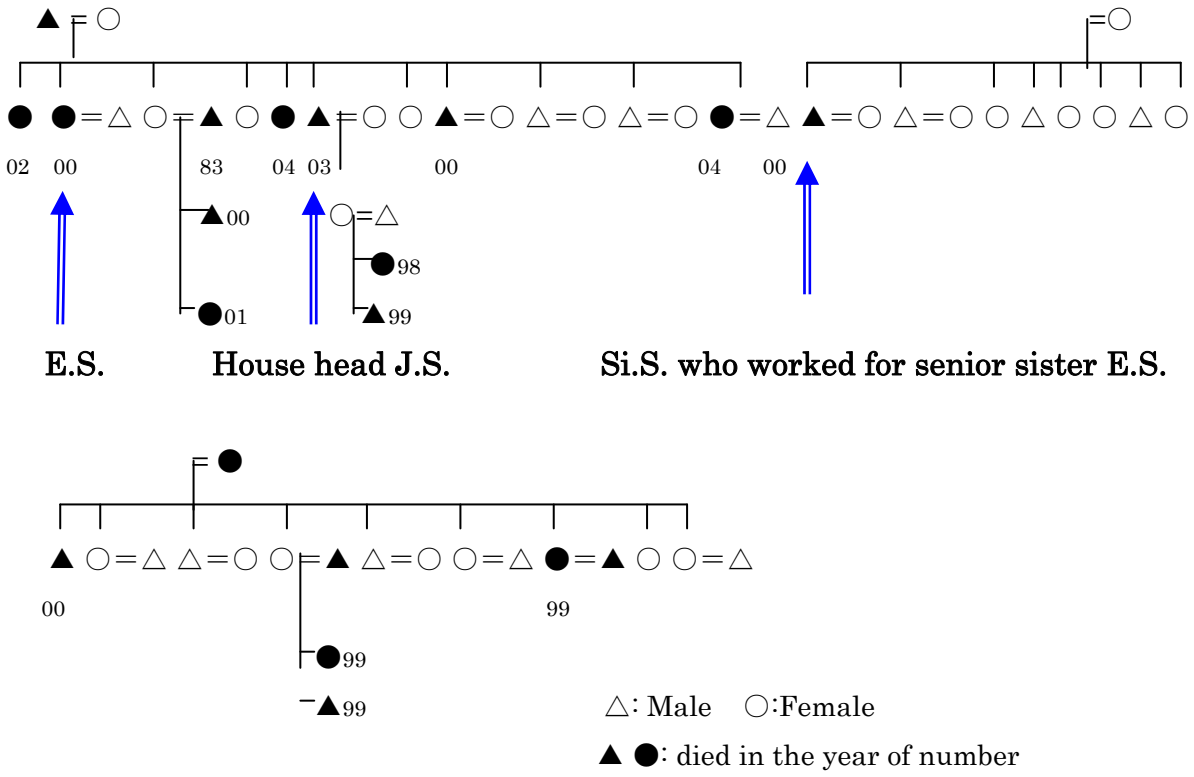

Fig. 7: Recent bereavement of family S

Case I: Death of the second wife of J.S. (November 1998)

J.S.'s second wife died after a short illness. On the occasion of her funeral, her brothers claimed some cattle and property, declaring that four cattle were overdue for the bride price. After long negotiations, they settled on cattle payments and allotment of property, and J.S. agreed to pay two cows and a calf. These negotiations continued for several weeks during the busiest time of the maize cultivating season. During his absence from the village, J.S. left his junior brother in full charge of group farming activities.

Case II: Death of the junior brother, Si .S.(May 1999)

Si,S. the junior brother of Jo, lived with their senior sister in village M, about 50 km from village C. Si.S. had been sent to help her farm after the death of her husband. Her husband had been a policeman who had helped family S on several occasions, e.g., he had settled disputes with another family and obtained detention releases.

Si.S. died after 18 days in a hospital, so Jo and his two young brothers went to village M to help harvest maize for their sister. They stayed there for over three weeks and harvested >200 90-kg bags of maize. The medical costs were two million Kwatcha (equivalent to U.S. $800 at the time). J.S. asked his sister to sell 85 bags of maize to make the payment, and he sold two of Si.S.'s cows to make up the difference.

He also slaughtered one cow for the funeral; thus, only one cow and one ox remained for the bereaved family. Si.S.'s wife returned to her father's house with her youngest baby. She took two sheep and all of her own property with her. J.S. took in the other four children; he and his junior brothers are now foster fathers.

During their long absence from village C, harvesting was left to the second senior brother and to J.S.'s children. However, the harvest was poor because of theft, which resulted from a lack of labor during the critical time.

Case III: The death of senior sister, E.S. (March 2000)

E.S.'s husband was an influential politician and very generous patron of extended family S. He contributed to shifting the village boundary to the east, towards the Forest Reserve.

This re-arrangement of the boundary lines secured land for the families around *dambo* K, which before 1981 marked the boundary between village C and the Forest Reserve.

E.S. had loaned J.S. a pickup truck and a flourmill to help extended family S, but her sons reclaimed them immediately after her death. They insisted that the truck and mill were generously on loan to family S but that the ownership had not been transferred to them. The dispute continued for over two months and prevented J.S. from harvesting his maize himself. J.S. asked his young brothers to help his children harvest the maize, but this repeated request angered the brothers. In this year, the large farming group of extended family S was divided into smaller groups based on each household. Since then, J.S. has cultivated his farmland with members of his own household.

Figure 8 shows the actual order of cultivation observed in extended family S, which made up the largest farming group in the village until the 1998/99 season. At that time, over four weeks were required to finish one cycle of cultivation. The group decreased in size during the 1999/2000 season and finally split into three groups in 2000/01. The case studies described above discuss the reasons for this dissolution. Junior members of the group were frustrated with having to wait for their turn to cultivate their own fields. To add to this, their personal losses imposed a heavy burden, both economically and socially. The big group was therefore perceived not as a help, but as a hindrance, and was subsequently dissolved.

(1) until 1997/98 rainy season: It took four weeks and two days for one cycle.
JaJaHeHeJoJo DaDaCrCrSiSi MuMuHaHaHoHo PaPaObObBrBr PaPa

(2) until 1999/2000 rainy season: It took two weeks and two days for one cycle.
JaJaHeHeJoJo DaDaCrCrSiSi MuMuJaJaHeHe JoJoDaDaCrCr SiSiMuMu

(3) The group was divided into three groups in 2000/01 rainy season:
(i) JoJoJoJaJaJa JoJoJoJaJaJa JoJoJoJoJoJo *JoJoJoJsBrPa*
(ii) DaDaDaDaDaDa (after second week, Da asked a friend farming by contract)
(iii) CrCrCrMuMuHa CrCrCrMuMuHa CrCrMuJo*CrCr CrCrCrCrCrCr*

1st cycle 2nd cycle 3rd cycle *4th cycle*

Fig. 8: Actual order of cultivation in the family S

The long and frequent absences of J.S. from the village also affected group farming. The head of an extended family who organized and made all group cultivation decisions became more occupied with non-agricultural issues, such as visiting the hospital, preparing and arranging funerals, and paying and collecting debts. During his absence, the second or the third senior male made decisions in lieu of the head of the family, but so many deaths, and such long absences on the part of the household head affected farming practices. His control over upland farming became weak and junior members who acted on his behalf became displeased with their position as only 'acting' heads of the household.

VIII. Conclusions and remarks

Successive deaths of family members have influenced upon agricultural production seriously. In addition to the direct and immediate impact of deaths, there are indirect and prolonged effects, such as to foster children, to pay off debts, to settle succession, and to re-organize group for farming.

The mutual help system that was devised to compensate for a lack of cattle, equipment, and labor was rendered dysfunctional by these prolonged effects. The mutual help system like large farming group has become unable to absorb the burdens created by the frequent deaths. Instead, the system functioned as a catalyst that transmitted vulnerability among members of the group.

This study implicates that the well functioned institutions in normal condition may increase vulnerability in case of abnormal situation instead of preventing it. This means that

factors operate to enhance vulnerability one time may act to reduce vulnerability in other time. The orbital process of increased vulnerability is complicated.

This is why we should be very careful to analyze the vulnerability and resilience of society. The hasten generalization of increased process of vulnerability should be avoided. Instead vulnerability and resilience of a society should be studied deliberately by understanding the particular geographical and historical settings.

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