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Fallows, Fodder and Fences: The Critical Elements of Integrating Livestock into Swidden Systems ✧

Malcolm Cairns
Associate Scientist
Southeast Asian Regional Research Program
International Center for Research in Agroforestry (ICRAF) †

Abstract

This paper begins by sketching the traditional role of animal husbandry in swidden-based farming systems in S.E. Asia's uplands. It contends that in the context of regional economic trends, Lao P.D.R. has a comparative advantage in producing livestock for sale to its more affluent neighbors. Expansion of the livestock sector holds promise of increasing productivity of the rural labor force by converting available feed resources into marketable surpluses and increased cash receipts.

Current trends towards intensification of swidden cultivation have the potential to dovetail neatly with increased fodder production for ruminant livestock. Citing examples of indigenous innovations to manage fallow vegetation to enhance its fodder value, the paper proposes building on this concept in converting swidden fallows into improved pasturage / fodder banks that combine benefits of both soil rejuvenation and fodder production. The livestock become important in accumulating nutrients which are then returned to the field through dung. Development of improved fodder resources usually encourages a parallel movement towards livestock confinement in cut-and-carry systems; as long as free-ranging continues as the norm however, fencing solutions will be critical to protect fodder banks from over-grazing and soil compaction.

In addition to the practical benefits, it is also politically astute to modify swidden cycles into what is essentially a fodder-food crop rotation. Conversion of fallows into a carefully managed fodder phase would resonate favorably with state policies to sedentarize swidden agriculture and reduce burning, and thus build a clear argument for their recognition as agricultural lands under the customary tenure of local communities.

Keywords: livestock, uplands, Lao P.D.R., intensification, fallow management, fodder, fences

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† ICRAF, P.O. Box 161, Bogor 16001, Indonesia. Phone: 62-251-315234 (O), 62-251-331247 (H); Fax: 62-251-315567; E-mail: icraf-indonesia@cgnet.com OR icrafind@server.indo.net.id

1. INTRODUCTION

No country has a greater vested interest in identifying pathways to stabilize and improve productivity of stressed swidden systems than the Lao P.D.R. Its overwhelmingly agrarian economy absorbs 72% of the country's labor force (FAO, 1992) and within this group, an estimated 337,000 families engage in variations of shifting cultivation (Chazee, 1991). This is largely a reflection of the remote mountainous terrain that comprises 80% of Lao territory and offers few viable land use alternatives to subsistence upland communities. Although population densities remain relatively sparse, a 3.2% growth rate (World Bank, 1992) and increasing government pressure to adopt more permanent forms of cultivation emphasize the need for farming systems to evolve into more intensive models.

Case studies provide compelling evidence that expansion of the livestock sector may be a strategic response to collapsing swidden systems. Lack of animal traction for soil tillage is often cited by farmers as a key reason for continued reliance on shifting cultivation (Subedi, 1997)[1]. Development efforts have shown that provision of draft animals may enable farmers to develop their highest potential fields for permanent cultivation, thus alleviating swidden pressure on more marginal sloping lands (Sayre, pers. com.[2]; Tyler, pers. com.[3]). Animal husbandry also has good potential to generate alternative incomes for shifting cultivators by converting available native grasses and browse into livestock sales with little labor investment.

Despite its promise, the potential role of livestock in the Lao uplands has received little research attention. A key recommendation emerging from the 1993 meetings on 'Shifting Cultivation Systems and Rural Development in the Lao P.D.R.' confirmed that more work is necessary to promote animal production in shifting cultivation areas (van Gansberghe and Pals, 1994, p. 15).

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[1] A study spanning three districts in Nepal revealed that shifting cultivation was adopted, in part, as an easy way to grow cash crops without ploughing.

[2] Heifer Project International's experience in the Philippines verifies that provision of draft animals in *Imperata*-dominated, marginal hill regions resulted in longer fallow periods as farmers used the draft animals to generate additional income.

[3] A case study conducted by the Center for Protected Areas and Watershed Management (Lao Dep't of Forestry) in Xieng Khouang, Laos, documented that a main factor leading to higher levels of swiddening was the lack of buffalos to break new land for paddy rice. After the project established a revolving fund to introduce buffalos, wet rice cultivation increased, swidden declined, and the revolving fund is being replenished.

Paradoxically, a study in West Sumatra, Indonesia recorded declining cattle and buffalo populations as introduction of improved irrigation and high-yielding varieties (HYV) allowed farmers to move from a single rice harvest per year to continuous cropping. Since paddy land was no longer fallow for part of the year, there were insufficient feed resources to sustain former livestock populations. Draft power was also in less demand as the continually flooded terraces remained soft and ploughing was no longer necessary. The greater labor absorption of multiple cropping HYVs in irrigated valley land markedly reduced swidden pressure on adjacent slopes. Fallow land was widely planted with cinnamon (*Cinnamomum burmanii*) as a high value product requiring few labor inputs (Cairns, 1994).

In undertaking this work, a serious challenge will be to develop a holistic understanding of the myriad of factors impinging on livestock production in the Lao uplands and adapt husbandry systems that resonate with the constraints and opportunities unique to each locality. If we map the tremendous complexity of Lao ecosystems (latitude; altitude; slopes; aspect; climate; vegetation; etc.), and overlay this with cultural variations (68 ethnic groups with distinct dialects; customs; indigenous knowledge; and farming systems) and socio-economic factors (degree of remoteness; access to road infrastructure, markets, extension services, and veterinary care; involvement in cash economy; availability of off-farm livelihood options), then the aggregate picture is one of profound heterogeneity. This underlines the inadvisability of thinking in terms of developing model livestock systems or packages. Research should instead focus on generation of a menu of tested technology components and assist farmers to evaluate how they may fit into their farming systems.

Despite the inherent complexity of identifying suitable niches for improving livestock performance within swidden environments, a number of overarching themes may be articulated that have wider extrapolation value across S.E. Asia's uplands. To provide context, this paper begins by characterizing the low-input animal husbandry as traditionally practiced by swidden communities, and discusses recent macro-economic shifts in the region that make livestock an increasingly attractive option for Lao upland communities. Drawing from examples across S.E. Asia, it then elucidates how swiddenists are responding to land-use intensification pressures by developing strategies for improved fallow management. The potential role of livestock within this trajectory of swidden intensification is described, and three interlinking factors - fallows, fodder, and fences - are highlighted as critical research issues.

2. THE REGIONAL CONTEXT

A. Historical Role of Livestock in Swidden-Based Agroecosystems

The practice of harvesting animal proteins from swidden fields has a long and widespread history throughout the uplands of S.E. Asia. Although wildlife predation on crops was, and often continues to be, a serious problem, farmers often exacted some degree of compensation through hunting and trapping activities. Crude traps, carefully interwoven into perimeter fences of swidden plots, both reduced crop losses and yielded wild game, such as feral pigs, porcupines or field rats. As the ripening rice crop attracted hungry birds, perches were erected in strategic locations and coated with sticky tree resins, again performing the dual roles of pest control and supplementing the household diet. When reopening swidden fallows, rambutan (*Nephelium* spp.) and other wild fruit trees were intentionally protected as favored hunting sites. Flowering trees recognized as important nectar sources for honey production, such as *Lithocarpos sp.,* were similarly spared the axe. Grasslands were often burnt annually, both to flush out hiding game, and use the young succulent regrowth as a bait to attract wild herbivores. At forest margins where wildlife is relatively abundant and markets often distant, swidden communities typically rely heavily on hunting, trapping and fishing activities to capture protein sources freely available from the environment. As anyone who has visited rural Lao markets can verify, surplus bush meat is also a significant source of supplementary income.

As humans gain more control of the landscape and farming systems intensify, the livestock component assumes increasing importance. Receding forest margins and dwindling wildlife populations catalyze a shift away from increasingly unproductive hunting activities to greater emphasis on livestock as a strategy to convert expanding grasslands into animal proteins. As natural fish stocks decline, fish ponds and rice-fish culture (talapia, carp and snakehead) provide better returns to labor than continued fishing in depleted streams. Thus, as wild protein resources become scarce, hunting and fishing are relegated to occasional leisure activities - and fish and meat needs instead met through expanding aquaculture and livestock enterprises.

Although animal husbandry techniques appear rudimentary and flawed to casual observers, they are arguably rational in the context of constraints and opportunities inherent in remote upland areas. Swidden practitioners generally suffer from serious labor constraints - and most decisions are based on perceived returns to labor invested. Free-range grazing and scavenging by livestock allow farmers to capitalize on abundant feed resources and convert them into animal products with few additional labor inputs. Large ruminants (buffalo, cattle, mithun) and small (sheep and goats), and sometimes horses, thus roam freely up to several kilometers from their owners' villages, grazing forests, swidden fallows, and crop residues. Some farmers use salt or other feed supplements to lure livestock back to the village in the evenings, confining them in corrals or tethering them under the house. Others receive much less frequent handling and are left to forage on their own for days or weeks at a time. Swine and poultry scavenge in the vicinity of village compounds, receiving supplementary feeding of rice husks and other household scraps. Swine often receive more intensive care, with corn and cassava boiled daily and fed as a mash. Their inability to digest cellulose means that a relatively greater proportion of their diet must include grains and other starch sources, making them more competitive with humans for scarce food resources (Ramakrishnan, 1993, p. 107).

Although this minimalist approach pervades livestock husbandry throughout S.E. Asia's uplands, the details of species reared and management practices are more site-specific, shaped by a complex of ecological, socio-cultural and economic determinants. While pigs are very important culturally to Christianized swidden cultivators in Irian Jaya, they are of course completely absent from farmscapes in Muslim areas of the Indonesian archipelago.[4] Hmong communities dispersed throughout the hill region of mainland S.E. Asia also rely heavily on swine for ceremonies, festivals and rituals. The Tala-andig in Bukidnon, Mindanao, are perhaps typical of many indigenous communities in the region's uplands, in traditionally rearing pigs and chickens to sacrifice on ritual occasions and appease powerful spirits. Mithun (*Bos frontalis*) and yak (*Bos grunniens*) are restricted to the higher altitude slopes of the Himalayan foothills where wide tracts of forest are available for grazing. Cooler temperature and abundant grasslands have spawned important cattle industries in high plateaus such as Xieng Khouang or Bolovens in Laos.

It is noteworthy that in cases where more intensive livestock management does occur in the uplands, its practitioners are often migrants from more densely populated areas with traditions of settled agriculture. For example, Javanese farmers relocated to Indonesia's Outer Islands through the government-sponsored transmigration program apply noticeably more intensive crop and livestock husbandry techniques than their indigenous neighbors. Nepali farmers migrating into northern India bring with them a strong affinity for cattle. Careful management of dung allows them to maintain nutrient levels under permanent cropping regimes - while local farmers continue to rely on fallow rotations to rejuvenate exhausted soils. Clearly these examples illustrate that the workshop's deliberations on problems and opportunities for livestock in the uplands of Lao P.D.R. must push beyond the technical issues discussed in this paper - and develop a complimentary understanding of the socio-cultural influences on animal husbandry.

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[4] Crop damage by wild pigs also tends to be more serious in Muslim areas because they are not routinely hunted and trapped for food. When communal pig hunts are organized, e.g., by Minangkabau in West Sumatra, it is strictly to cull populations and contributes nothing to the household diet. A successful hunt may routinely yield six to eight large pigs, all of which are discarded or left to the dogs to devour (reportedly to hone hunting instincts and whet their appetite for pig blood).

B. Winds of Change: Macroeconomic Trends in the Region

Laos is surrounded by some of the fastest growing economies in the world. This is likely to assume increasing importance as Laos, along with Myanmar, has recently joined the ranks of ASEAN[5] and international boundaries will become more porous to the movement of goods and services. Although the booming financial hubs of Bangkok, Kuala Lumpur or Singapore are far removed from the subsistence-based economies of the Lao uplands, these macroeconomic trends present distinct new opportunities for swidden farmers.

Rapid expansion of industry and service sectors has fueled the region's impressive economic growth over the last several decades. The lure of new employment opportunities has catalyzed large demographic shifts from rural areas to urban centers. As increasing percentages of the labor force abandon agriculture in favor of off-farm jobs, economists describe 'Countries with Abundant Rural Labor' (CARLs) as reaching a structural transformation turning point when the absolute size of the agricultural labor force peaks and begins to decline (Tomich et. al., 1995, pp. 1-34). This juncture is usually reached when the portion of the national labor force working directly in agriculture declines to about 50% - and marks the transformation from agrarian to industrialized economies (see Figure 1)[6]. These shifts in national economies bring important implications to animal husbandry from both demand and supply perspectives. From the demand side, an expanding middle class devotes more of its disposable income to expensive food products - causing an upsurge in consumption of beef and dairy products.[7] Domestic beef production can not meet market demands in either Thailand or Malaysia, and both rely heavily on imports. Industrialization has important implications to farming systems as diminishing farm populations cause a shift in emphasis from land-use intensification to adoption of labor-saving technologies.[8]

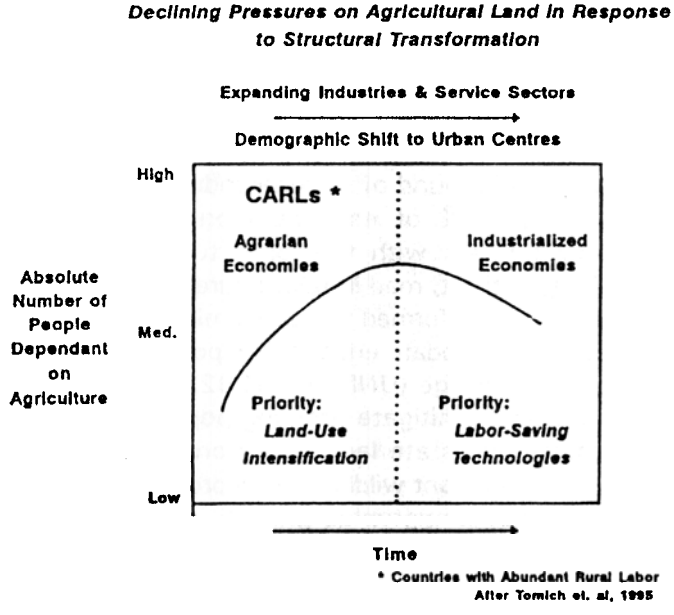

Figure 1.

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[5] Current ASEAN (Association of Southeast Asian Nations) membership includes Brunei, Indonesia, Malaysia, the Philippines, Singapore, Thailand, Vietnam, and most recently, Myanmar and Lao P.D.R. Consideration of Cambodia's application has been put on hold following recent serious political upheavals there.

[6] Tomich et. al. (1995) suggest that China, Indonesia and Thailand are all poised to reach this turning point by the year 2000.

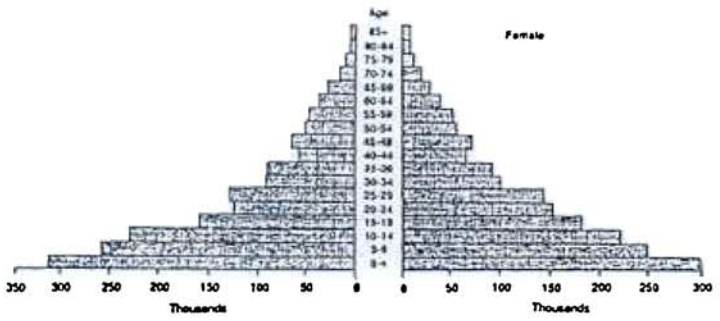
[7] This optimism may have to be tempered somewhat in view of the recent financial meltdown in Thailand and its domino effect on other S.E. Asian economies.

[8] Both Thailand and Malaysia are now experiencing severe labor shortages in their agricultural sectors and have responded with policy changes to permit labor imports from Myanmar and Indonesia respectively. The recent popularity of direct seeding wet rice in Thailand is symptomatic of rural labor shortages. Similar trends are visible in Malaysia where rubber plantations, requiring daily tapping, are increasingly neglected or converted into oil palm for its superior profitability and lower labor demands.

Supply of livestock products will be based on farmer decisions on whether they provide the best return on investment of scarce land, labor and capital resources. This equation changes as developing economies bring new opportunities and constraints. Mainland S.E. Asia does not have the Spanish-influenced tradition of large cattle ranches accommodated by skewed land holdings that are common to South America and to some extent, the Philippines. Livestock are generally reared by smallholders with modest herd sizes and family labor is the dominant factor of production. With industrialization, surplus household labor may disappear as women and children who traditionally care for livestock accept factory jobs and spend more years in school. This trend is reportedly already apparent in northern Thailand, with many smallholders selling their livestock, while others specialize in herding larger commercial herds that offer superior economies of scale (Turkelboom, 1996, p. 449). In the presence of more attractive options, growing labor constraints will presumably force a shift to more efficient patterns of livestock husbandry.

C. Implications to Lao P.D.R.'s Livestock Sector

Against this background of regional industrialization, the Lao economy still remains overwhelmingly agrarian. The 85% of its population residing in rural areas (UNICEF, 1992, p. 9) are largely subsistence farmers with few opportunities to supplement on-farm earnings with wages. The topography is difficult, road infrastructure is sparse, and rural labor markets are minimal. Swiddening that has traditionally formed the economic backbone of many upland communities is under mounting pressure to accommodate endogenous population growth; by 1992, 45% of the Lao population was under 15 years of age (UNICEF, 1992) (Figure 2). Historic strategies of migrating into unclaimed forest frontiers to mitigate growing population densities are now less tenable. The government's firmer control over state land, sanctions against land management involving fire and fallows, and gazettement of remnant wildlands into protected areas (IUCN, ----) all make agricultural expansion less possible. Rapid demographic growth, with few non-farm activities to invest time and skills, has forced subdivision of the finite agricultural land base into smaller farm sizes (Figure 3).



Source: Lao PDR, Population Census, 1985.

Figure 2. *1995 Lao Population Profile*

This has set the stage for the classic downward spiral of swidden degradation that, at various degrees of severity, is endemic throughout the uplands of S.E. Asia (Figure 4). Shortened fallows and lengthened cropping periods have pushed Lao swiddening beyond its ecological resilience, as evidenced by declining crop yields and expansion of *Imperata* and bamboo succession climaxes. Farmers are unable to finance purchase of compensatory nutrient inputs. Ecological degradation is accompanied by diminishing marginal returns to labor and a serious threat to food security. This pattern of swidden decline is predictable and repeatedly played out when upland farmers are unable to adapt their land management to keep pace with mounting land use pressures; deterioration of the resource base may reach crisis levels before remedial modifications are adopted and the farming system gradually regains equilibrium with the environment. Strategic research needs to proactively anticipate this dip and identify interventions to short-circuit this destructive cycle (Figure 5).

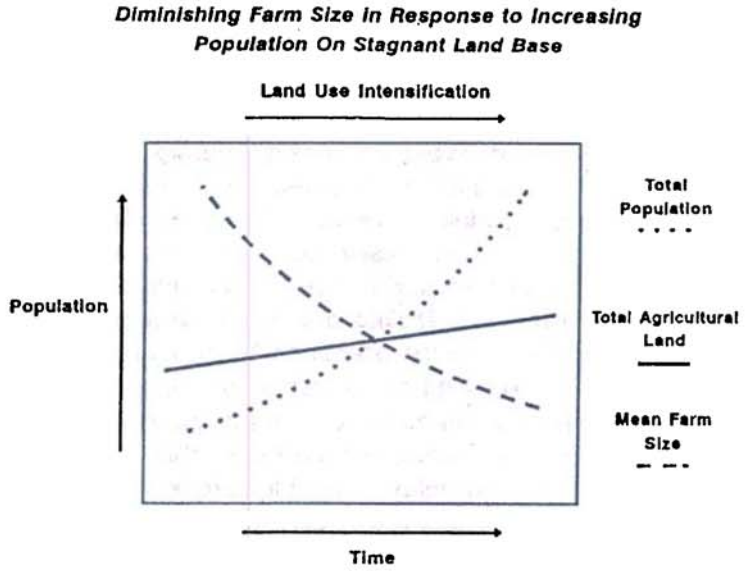


Figure 3.

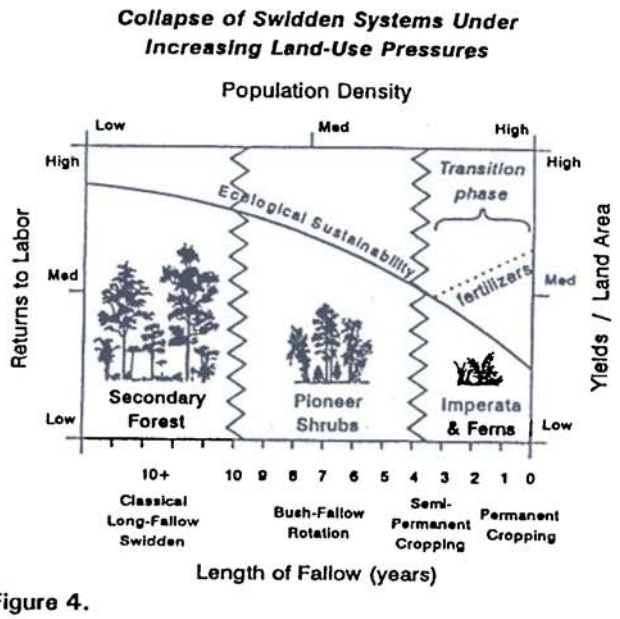


Figure 4.

In this context, the key issue is the potential role of livestock to reduce pressures on collapsing swidden systems and restore productivity of agricultural labor in the Lao uplands. An assessment of their productive assets reveals that upland farming communities remain relatively rich in land - but have negligible capital. Labor is the most critical input over which farmers have some control - and strategies to improve rural living standards need to identify more remunerative enterprises to occupy family labor that both provide marketable surpluses and ease swidden pressures. Lao P.D.R.'s large land reserves and sparse population densities suggest that it has a comparative advantage in farming systems that are land-demanding but require only moderate labor inputs.

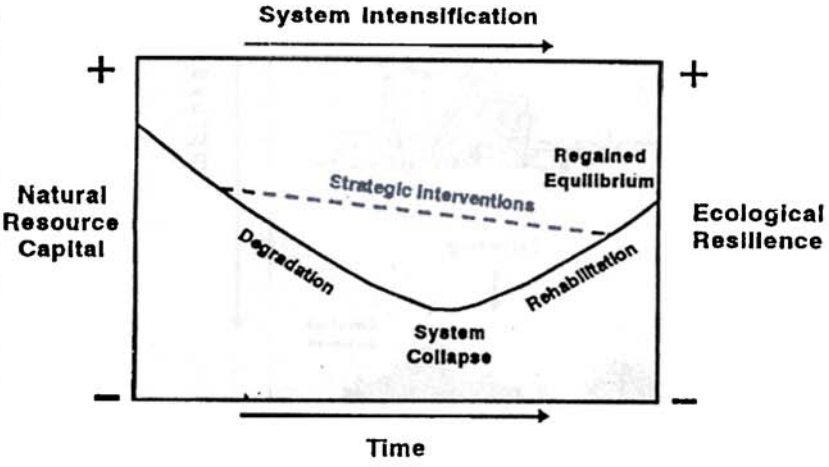


Figure 5. *Recognition of System Degradation and Adoption of Remedial Interventions Prior to System Collapse*

Production of both economic trees and livestock - or silvopastoral combinations, fit this criteria in that capital accumulation takes place with modest labor investment. Livestock offer other attributes that make it a well adapted and profitable option for shifting cultivators. Unlike trees, they can be herded to the nearest road at the time of sale. Livestock are adaptable to a wide range of management

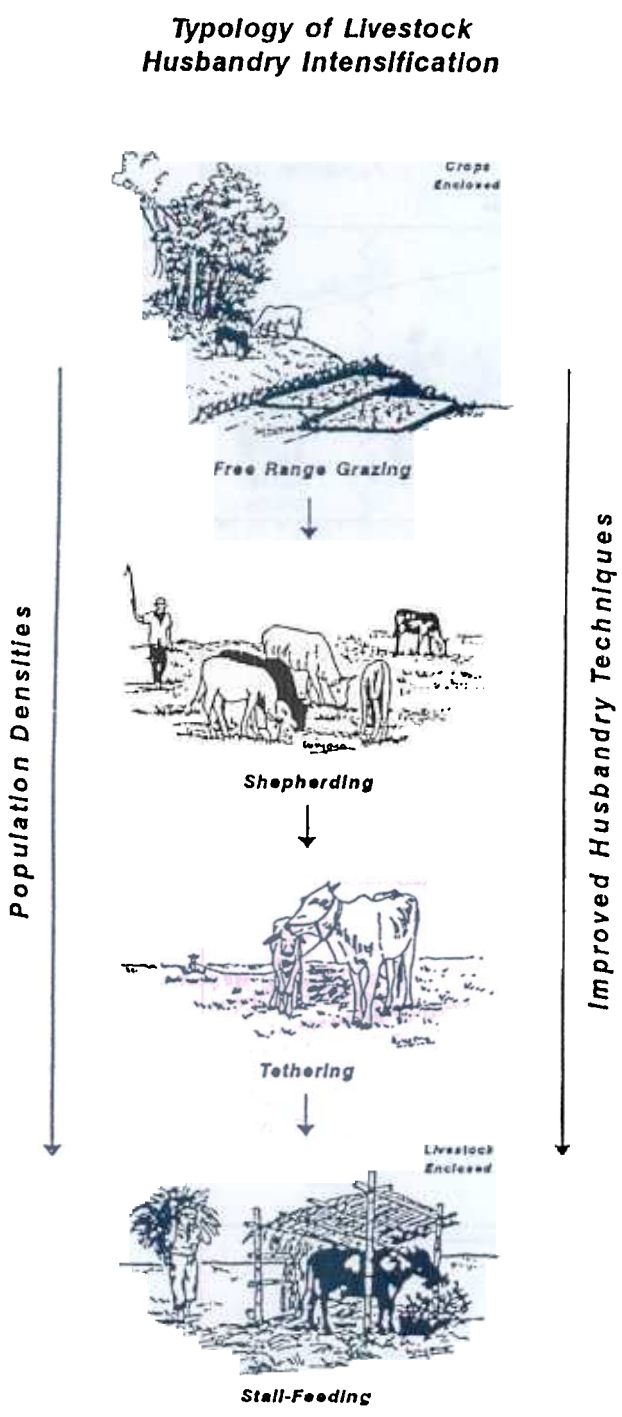


Figure 6. *Temporal Dynamics*

options that can be adjusted to fit changing circumstances (Figure 6).[9] They are equally versatile in terms of when they are marketed; unless the need for cash is urgent, unfavorable terms of sale can be rejected in favor of delayed marketing and continued liveweight gains. Ruminants are economically efficient in converting crop residues and available grazing during the fallow periods into animal proteins. They act as banks, accumulating wealth in swidden communities that can easily be liquidated to finance rice purchases during the hungry season. Cattle and buffalo can facilitate adoption of more intensive land husbandry practices by providing draft power for soil tillage and transport of crops to market. Manure management may play an important role in accumulating nutrients that are then recycled back to fields. Small livestock such as poultry, pigs and goats are widely important for ceremonial obligations and are a more convenient size to slaughter for household consumption.

Thailand, with a shared border of 1700 km., provides the most significant opportunity for export of Lao livestock. The Thai market of 58.1 million people dwarfs the Lao population by a magnitude of 12.6 times. In addition to the comparative size of the market, GNP per capita of Thai consumers is roughly 7.5 times greater than that of their Lao neighbors (Table 1). If affluence is taken as a strong indicator of market demand for livestock products, and sparse population densities are conducive to its production, then the map in Figure 7 provides an indication of the pushes and pulls that would determine livestock movements across international boundaries in the absence of trade barriers.

These statistics are not unknown to Lao farmers as evidenced by estimates that, despite restrictive tariffs, an estimated 100,000 cattle and buffalo were smuggled from Laos into Thailand during 1993-94 (Cheva-Isarakul, 1996).[10] With ambitious road infrastructure projects underway, and recent membership in ASEAN promising to promote

[9] While remote areas with abundant grasslands can ideally be exploited by extensively managed, free-ranging livestock, the African experience, where cattle numbers are highest in areas of highest human population densities, does highlight the versatility of management systems to intensify as conditions warrant.

[10] Lao farmers in Bokeo and other border provinces cite theft of cattle and buffalo and rapid smuggling across the border into Thailand as a major problem.

stronger trade linkages with Asia's tiger economies, clearly the Lao livestock industry holds the potential for very rapid development.[11] Dairying could be developed in higher potential areas near Vientiane and Thai border markets in the long term, but beef holds promise even in remote corners of the country.

Table 1. *Basic Indicators for Lao P.D.R. Compared to Neighboring Countries*

Country	GNP per capita *		Population * (millions) mid 1993	Population growth rate ** (% per annum. 1989-2000)	Area * (thousands of sq. km.)	Population Density * (people/sq. km.)	Labor force in agriculture *** (%)	Life expect at birth * (years) 1993
	Dollars 1993	Avg ann growth (%), 1980-93						
Lao P.D.R.	280	–	4.6	3.2	237	19.4	72	52
Cambodia				1.9			70	
Vietnam	170		71.3	2.1	332	214.8	61	66
China	490	8.2	1,178.4	1.3	9,561	123.3	68	69
Myanmar			44.6		677	65.9		58
Indonesia	740	4.2	187.2	1.6	1,905	98.2	50	63
Philippines	850	-0.6	64.8		300	216.0		67
Thailand	2,110	6.4	58.1	.4	513		64	69
Malaysia	3,140	3.5	19.0		330	57.6		71

Sources: * World Bank, 1995.
** World Bank, 1992.
*** FAO, 1992.

3. EVOLUTION OF ANIMAL HUSBANDRY TECHNIQUES IN RESPONSE TO CHANGING CIRCUMSTANCES

Any investigation of potential niches for improved animal husbandry must be in the context of the wider farming system of which it is a component. Evolution of land-use systems require corresponding adjustments to how livestock are managed. Changing circumstances of availability of productive inputs (e.g., fodder resources, household labor supply, vaccinations and veterinary care, breeding stock, credit, etc.), market access (e.g., construction of new roads, arrival of middlemen buyers, restrictive tariffs on international borders, etc.), and village regulatory institutions (e.g., local conventions on responsibility for fencing, liability for livestock-inflicted damage, access to communal grazing lands, etc.) and alternative investment opportunities (e.g., off-farm employment, cash cropping, etc.) all bring new opportunities and constraints ... and are carefully entered into farmers' calculus on the 'if' and 'how' of livestock management.

[11] It remains to be seen if Thai livestock producers will successfully lobby for continued protectionist tariffs against Lao imports. Presumably this could be done without violating the ASEAN spirit of liberalizing trade by citing the imperative of controlling infectious livestock diseases. Laos is very vulnerable to continued restrictions on livestock exports on this basis.