

## **Biodiplomacy of the Sago Palm in Papua New Guinea – A Systems Thinking Approach**

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### **Abstract**

Sago palm's versatility to grow in hostile conditions and its ability to act as a natural carbon dioxide sink, in the light of environmental damage control, as stressed by Stanton (1993) and recent studies bordering on the morphological variability and genetic diversity of sago palm in Indonesia (e.g. Ehara et al., 2000), in the Pacific Island Countries of Papua New Guinea, Vanuatu, Solomon Islands (cf. Dowe 2001, 2002; Ehara et al., 2003), have all suggested a fresh multidisciplinary approach to promote sago as a multipurpose food crop and an indispensable industrial material for the 21st century. Adaptive research programmes into soil management, sago estate development and creating effective market distribution of sago-based products, of which networking between multidisciplinary academic communities and sago user groups are quite necessary.

Finding synergies (i.e. apt combination and application of resources) within the sago palm industry calls for concerted efforts to promote sago, of which biodiplomacy is not only a vehicle for strategically managing sago resources but is critically important. This strategic management approach weaves biodiplomacy around international negotiation processes and structures. Biodiplomacy is then seen as a vehicle to pave the way for mobilising scientific and indigenous knowledge, appropriate level of technology application, let alone building a network of information society to better manage sago resources. This information society will enhance plant genetic resources, access and benefit sharing, which underlie important human learning and participatory development of societies. This study also explores the inter-linkages between biodiplomacy and bioethics of the sago palm, determining how these linkages will provide the basis for not only sustainable agriculture and rural development, but also has implications for biosafety and biotechnology issues (Laufa 2004).

**Keywords:** biodiplomacy, bioethics, sago palm, systems thinking approach sustainable agriculture, community asset building, sago modernity project, sago using agrarian societies

### **Introduction**

As countries grow and transform their many different sectors in their overall commitment and efforts toward attaining a desirable macroeconomic

environment, the inevitable recurring problems inherent in the development process become more prominent. The rush to gain rapid economic development is often met with problems of harmonizing the social and physical milieu with somewhat dialectical expectations of its citizens in either an urban or rural setting, which paints the kaleidoscopic patterns of development. Of grave concern is the need to focus on the social welfare of a country's citizens. A dilemma that confronts this multi-dimensional development process is linked to the critical issue pertinent with whether pursuing high rates of economic growth (gross national product or gross domestic product) is desirable over appalling living conditions in most developing countries; clustered together as the third world countries.

Adjusting policies to accommodate environmental concerns with economic growth have recently come to the fore and have awakened most economists to ponder these issues thoroughly, more than ever before. Implicit in the discussion is the assumption that there is persistent coexistence of dual economies that is the rural-urban bias, which is interwoven around the centre-periphery structure. This rural-urban bias remains somehow static, until a certain interactive force acts upon society to unleash its potential to move a purportedly backward society forward and negate this bias relative to spatiotemporal and its implications for wider welfare considerations.

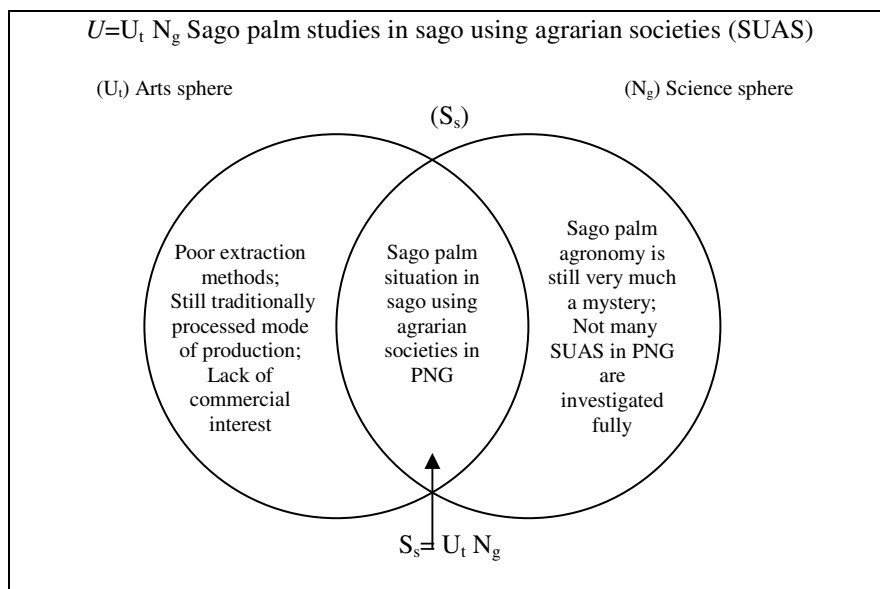
Premised on this condition, it would be interesting to provide a theoretical explanation, which penetrates the realm of other development theories to provide an alternative view for promoting development in essence, say, for sago using agrarian societies in mainly tropical countries such as Papua New Guinea and other neighbouring socio-economically underdeveloped tropical countries such as Philippines. The whole essence of providing an alternative paradigm shift becomes crucially important to foster revised ways of development thinking, which would explore more vigorous intellectual initiatives, among other existing development theories or concepts such as action research method, which is now putting into proper context the processes entailed as well as how each stakeholder plays a crucial role in arriving at a predetermined or anticipated more secure livelihood outcomes.

After all, theories do not solve problems, be it conceptual or real problems, but they provide the basis for creative approaches to systems thinking, which would therefore require synthetic efforts on the part of scholars to provide the intellectual dynamism, founded on the principles of verifying generalizations in a systematic way, answerable to scholarly inquiries. By way of critically espousing claims in support of an eclectic paradigm within the scope of community asset building in sago using agrarian societies, it is quite necessary to review the sago palm situation therein; so as to discuss the fundamental aims of promoting sustainable agriculture and participatory rural development in PNG.

**Sago palm situation in sago using agrarian societies in PNG: A systems thinking approach**

To review the existing sago palm situation in sago using agrarian societies in Malalaua area of PNG, a Venn diagram (Figure 1) applying the concepts underlying the usefulness of set notations was used for illustration purposes.

Let the universal set  $U=U_t \cup N_g$  denote the sago palm studies in sago using agrarian societies, which explains that ‘underutilization phenomena’, denoted ( $U_t$ ) is a union ‘neglected aspects’, denoted as ( $N_g$ ). More specifically, the sago palm situation in sago using agrarian societies in PNG is best represented by an intersection of the ‘underutilization phenomena’ and ‘neglected aspects’, which is represented as ( $S_s= U_t \cap N_g$ ). Given the set notations in words, this study attempts to address the ‘underutilization phenomena’, which characterizes the nature of ‘arts sphere’ or the social world, as per Figure 1, which underscores at least two key elements.



**Figure 1 Venn diagram depicting the sago palm situation in sago using agrarian societies in Malalaua Area of Papua New Guinea**

Source: Laufa (2004), p.39

Firstly, poor extraction methods, meaning pith extraction and starch washing are relatively inefficient, thus resulting in lower dry sago starch yields during sago making in sago using agrarian societies, which pointedly, means lack of technological advancement. The apparent evidence is from the use of the traditional tool, called the ‘*movora*’ (in Toaripi language). Secondly, and perhaps more critically, is the apparent lack of commercial interest in developing the sago palm industry so as to transform this industry to an agribusiness-oriented industry, among other commercially viable rural

agricultural products to support other rural development efforts, thereby supporting and creating the potential for enhancing community asset building process in sago using agrarian societies .

Lack of commercial interest in developing the sago palm industry in PNG has many contextual dimensions taken from absence of assigning property rights; which is implicitly made through genealogical claims, thus, interested foreign and local investors, facing high risks of not being supplied enough sago logs periodically, will not entertain financial loses as well as lengthy litigation over tenure matters, compounded by traditional landowners not voluntarily registering their parcels of customary land in the first place. Therefore a prisoner's dilemma situation here captures the essence of both resource owners and resource developers embraced in a mutual fear of loosing, or rather denied access to benefit sharing from the commercial exploitation of a plant genetic resource (PGR) such as the sago palm.

Conquering such a legitimate mutual fear needs compromising and dialogue from all stakeholders to clarify doubts, demystify mistaken beliefs, so as not only to heighten awareness on exercising control and management issues of the sago palm in sago using agrarian societies but also to effectively strengthen the path for science and technology to promote advancement of the sago palm industry in an underdeveloped rural agrarian area. At present there is no creative partnership forged between stakeholders, the sago palm and science & technology, thus the pathway to sustainable agriculture and participatory rural development for sago using agrarian societies is relatively weakened or arrested, thus sustaining the myth of 'underutilization phenomena' in principle.

With those relative inadequacies surrounding and suppressing the potential for developing the sago palm industry in sago using agrarian societies , as identified through the study, it is quite necessary a developmental task to seek potential remedial measures, which could address the 'underutilization phenomena' of the sago palm and move it to a more 'better utilized' food crop, and in time be a revenue generating cash crop for people in sago using agrarian societies in not only the study areas, but also extended to other sago growing areas elsewhere in the province.

#### **Means for negating the 'underutilization phenomena'**

To negate these 'underutilization phenomena' of the sago palm and transform it into a 'better utilized' food and cash crop (more commercially oriented), an eclectic paradigm promoting enhanced rural development for sago using agrarian societies is provided below. The eclectic paradigm shift of the sago palm attempts to explain the livelihood of people in sago using agrarian societies predating the onset of capitalism up till the present time and provides an analytical scope for furthering the sago commercialization process, which is made relatively easier now with the construction of a major highway road project, the Bereina-Malalaua road passing through these marginal marshy low-lying land of the Papuan Gulf (Laufa 2005).

### **An eclectic paradigm for sustainable agriculture-based rural development in sago using agrarian societies**

An eclectic paradigm for developing sago using agrarian societies further so as to promote sustainable agriculture and participatory rural development for the virtually underdeveloped areas is provided here. Firstly, this study postulates that the economic aspects of any form of development for underdeveloped sago using agrarian societies are initiated to propel societal transformation process from a rural agrarian society to a transitional society that has the latent potential for moving forward towards more secure and adaptable livelihood systems. Thus, the sago modernity project assumption; in this instance, is placed within the context of community asset building for sago using agrarian societies, which are described as a 'process', as a 'means' and its perceived 'outcomes' in the ensuing discussion to follow.

The Sago Modernity Project is seen here as a reactionary process instigated by infrastructure developments such as the construction of the Bereina-Malalaua road and how it necessitates or empowers people in sago using agrarian societies to take concrete steps to improve their livelihood further. The light of the so-called Western Cultural values, described as the 'Dialectic of Enlightenment' was superimposed on people in sago using agrarian societies in what was then the Modernity Project of promoting structured belief systems, religions, public administration and the like that still have significance and govern the livelihood of people today. While the processes of modernization are placed within socio-historical contexts, or rather a synchronic dimension of explaining the different time periods and their associated significance, the processes in which these historical events have caused different societies to adopt values and adapt these, are somewhat different in scope and nature.

For instance, Cox (1995) describes the differences in societal transformation as 'diachronic', others like Chennery (1970) relate to these as 'patterns of development' in their intellectual and creative efforts to explain development status quo in different parts of the world. From these expressed viewpoints, we shall take the position of identifying some of the ways to counteract as well as negate the forces shaping the 'underutilization phenomena', which appears to be afflicting sago using agrarian societies by proposing a community asset building process. This community asset building process as a SMP can be used for analytical purposes for working towards negating the 'underutilization phenomena' of the sago palm and move it towards a 'better-utilized' source of food crop, let alone an important material for other industrial uses domestically or internationally.

#### **Community asset building: Explaining the 'process', the 'means' and its perceived 'outcomes'**

Community asset building in less developed rural areas; especially, in purportedly underdeveloped sago using agrarian societies in Malalaua District is a function of effective development strategies tailored to suit local realities. Determining the available or existing natural renewable resource base, as can

be argued, for the sago palm industry is critical and indispensable to this development process. A worthwhile area for starting this community asset building process would be the gradual and adaptive establishment of cottage industry for sago palm in Malalaua District. Here it is argued that an integrated approach to rural agricultural development can provide food, labour, and capital to support increased employment in fledging industries and can stimulate demand in rural areas because of its comparative advantage in labour-intensive production (Norton and Alwang 1993: 19).

Moreover, establishing a cottage industry for sago palm processing and marketing would be seen as both an interventionist strategy for the community asset building process and a means geared towards achieving a desirable end such as food security, which has the added advantage of transforming sago using agrarian societies further. This would be the entry point for initiating the sago commercialization process on a relatively larger scale, with respect to estate or managed sago plantations in Malalaua District, of which currently there are none in PNG. A monoculture approach for sago palm agricultural development requires a capacity building process in light of manpower and institutional structures, in order to be effective in sago using agrarian societies .

Coordinated approach to integrating what is initially needed in terms of infrastructure provision such as canals, machinery and equipment, equally more important, is the urgent need for private rural financing to support and operationalize such a rural agricultural development scheme. A case in point is that of an experimental case of privately financed sago plantation scheme, which has shown remarkable growth and expansion of new sago plantations in Tebing Tinggi Sub-district in Riau, Indonesia as investigated and reported by Jong (2001, 2002), which could be used as a model for developing sago plantations in sago using agrarian societies in PNG and elsewhere by sago farmers and other interested private financiers in the sago palm industry.

### **Community asset building as a ‘process’**

It could be stated in explicit terms that the phenomenal change in the entrepreneurial behaviour of people within sago using agrarian societies in Malalaua District was made possible after the sealing of the Bereina-Malalaua road. The number of private motor vehicles providing rural transport services as well as the increase in the number of passengers, mainly sago starch and betel nut sellers aptly demonstrate that trade links between absolutely underdeveloped sago using agrarian societies in Malalaua District and the city of Port Moresby; lacking socio-economic development in the past, will graduate into a relatively forward moving society, nonetheless. This transformational trend from behavioural and spatiotemporal contexts, suggests that the change factor inherent in political economy of development studies, especially from the perspective of purportedly backward agrarian rural societies, by and large, requires necessary infrastructure support to develop its own potential further.

Moreover, sago palm utilization, to some extent, has changed dramatically after the construction of the road on a swampy, peat and mineral soil; much of the sago starch traditionally processed is becoming more commercially oriented; though relatively on a smaller scale, in a sense, that many sago farmers are keen and willing to sell their produce at markets in Port Moresby city market outlets so as to finance their other basic necessities of life. This traditionally processed sago starch can be further refined for improved or high-grade quality starch, or for other industrial uses, besides its main function as a food source. This can only be facilitated through establishment of an industrialization of the local food market so as to process sago starch in factories, which will be as competitive as those of Sarawak, East Malaysia.

#### **Community asset building as a 'means'**

Community asset building, as a means, explores the nature of providing sources of diversifying local entrepreneurial activities along the stretch of the Bereina-Malalaua road, with respect to location of economic activities such as a proposed site for sago factory, ventures into vanilla, oil palm and agro-based (agribusiness) activities. Better land use management skills are required to effectively utilize vacant or rather underutilized land, which could be further developed for commercial purposes such as raw material processing zones for sago using agrarian societies characterized by establishments of agribusiness networks. Because there are many private motor vehicle (PMV) operators now, the demand for fuel, tyre repairs will increase, which means that new local entrepreneurs may establish fuel depot and eventually develop it into a service station for travellers and motorists alike.

For sago farmers, they can increase their existing sago palm stock through clearly demarcating their parcels of land and voluntarily registering them under the Land (Group Incorporation) Act (1974) and have it recorded with the Land Titles Commission and with the Ministry of Lands and Physical Planning. This guarantees an effective land use management scheme for sago palm cultivation and utilization within the context of horticultural practice, as is sharply contrasted with the current situation in sago using agrarian societies, which is very much equated with harvesting from wild stands; a non-horticultural practice that has no legal basis and no room for improving starch productivity levels as was reported in Laufa (2004). With legally constituted land users groups within sago using agrarian societies, the next related task to be undertaken would be to form sago users' groups at the sago farmers' household level, as these proposed groups serve as the link and ultimate purveyors of sago starch to other distribution chains within sago using agrarian societies and other urban areas in PNG.

#### **Community asset building as an 'outcome'**

Utility serves as the quotient of happiness and people, regardless of beliefs systems, cultures, norms and practices crave for some sort of safety net system that will support their livelihoods and keep them secure in principle. Community asset building as an outcome takes stock of the perceived and

actual assets within the sago using agrarian societies after the introduction of a major road construction (public works) through what was once an idle low-lying swampy area. The road as an infrastructure serves as a tangible community asset for rural sago using agrarian societies and is only a means to an end and cannot lie idle; it must be used for either individual or collective benefits. This promotes Adam Smith's reflection that: it is not from the benevolence of the butcher, the brewer, or the baker that we expect our dinner, but rather from their regard to their own interest.

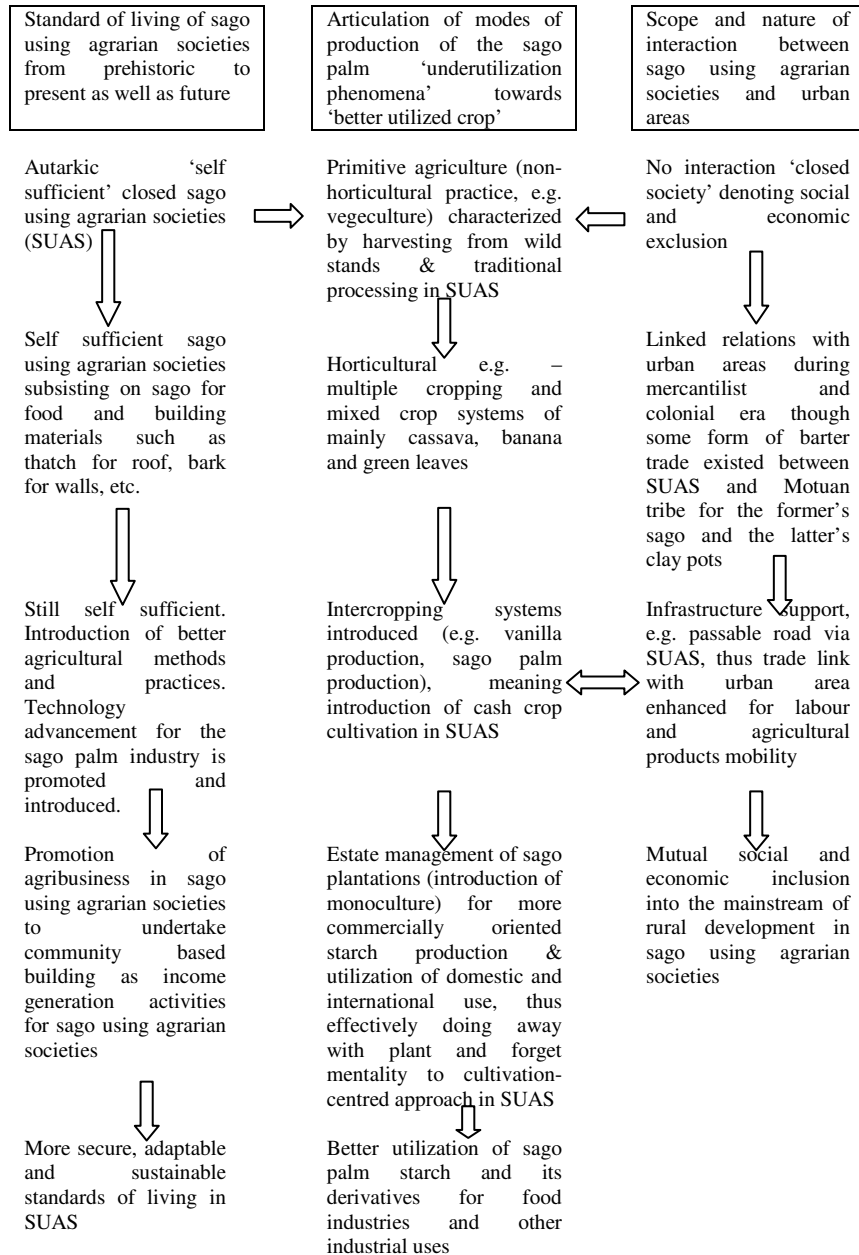
A schematic diagram espousing claims for a Sago Modernity Project is provided in Figure 2, which attempts to portray the indispensable tasks required for articulating the sago palm mode of production and utilization to gradual phases towards negating the 'underutilization phenomena' of the sago palm in sago using agrarian societies and move it towards 'better utilized' sago palm for its derivatives to emerge for sago farmers as well as for the food industries in time. Potential sources of industrialized food products such as noodles, crackers and confectionaries, among others produced from sago starch are quite popular in Malaysia and Indonesia. As Power (2002) pointed out, the growing demand for these products in Peninsular Malaysia cannot be met locally, which alludes to the possibility that PNG has to at least introduce sago plantations, let alone rehabilitate sago forests into sustainable sago plantations (e.g. Jong 2001, 2002) to meet this demand shortfall through promoting sago exports to Malaysia.

Malaysia has the technology for effective utilization of sago starch, but does not have the sago, PNG has the sago, but there are no unifying strategies to negate the underutilization phenomena, owing to use of traditional tools for sago piths, performed on a relatively small-scale, as was confirmed by the sago survey results (Laufa 2004). It takes on average 11 hours to produce only a mere 110 kg of sago starch per sago bole, of which about five people in a group, on average put in about a combined workload of 62.98 hours per sago bole. Productivity stands at approximately 2 kg of sago starch produced per hour by a group of five people over an 11-hour period. These statistics provide compelling evidence that higher forms of technology application are required to produce optimal sago starch yields in sago using agrarian societies in PNG, so as to tap into the world sago starch market, of which Malaysia has enjoyed comparative advantage for sometime now (Laufa 2004).

Articulating the sago palm modes of production is placed within an ecological boundary, of which the environment and natural resource use come under close scrutiny. Labour input accompanied by the traditional tool '*movora*' (in Toaripi language) absorbs much time. Sago serves as a natural social forests where exploitation of sago palms are undertaken through clan socio-cultural obligation wherein ownership issues are merely acknowledged through oral tradition, by passing history of sago palm management from one generation to the next by word of mouth. Genealogical basis underlies the significance of sago palm management, without recourse to appropriately defined legal frameworks to identify resource ownership in a system of official records. Therefore traditional exploitation revealing cultural traits is seen as a



management tool for analysing sago palm ownership issues in sago using agrarian societies, unlike in a stark contrast, there are managed sago gardens in Southeast Asian countries (Oates et al., 1999).



**Figure 2. Schematic diagram of articulating sago palm mode of production from 'underutilization phenomena' to 'better utilized plantation crop' in sago using agrarian societies**

Efforts to encourage people in sago using agrarian societies to farm sago on managed gardens is possible, but a lot has to be done to map all existing sago groves, through clear social mapping of clans, let alone, establish the basis on which they utilize sago. The use of the sago as a 'social forest' or 'community forest' (Figure 3), which predates colonialism and even capitalism are strategic point in which to judge the relative importance of sago palm utilization in era of heightened awareness of some of the useful general and specific properties of sago palm, of which many researchers, especially scientists, such as sago agronomists, botanists, biochemists, or even food biotechnologists are constantly grappling with.

The diagram (Fig. 2) attempts to portray spatiotemporal attributes of the transition undertaken by sago using agrarian societies, of which the three parameters are: (1) the standard of living of sago using agrarian societies from prehistoric times to present is slightly stressed; (2) how articulation of the sago palm mode of production is captured and (3) on the nature of relationship sago using agrarian societies had with an urban area. These ordinal scales are used to capture some of the attributes that mirror how the sago palm commercialization process in PNG can be pursued and such a small-scale study on sago using agrarian societies in Malalaua area, serves as a useful starting point.

#### **Sago using agrarian societies as 'latecomer developers'**

The use of sago palm as a food source as and building material, let alone a trading commodity has not dwindled, but has adopted a new logic of determinism, as it were and has also assumed a new status as a 'late-comer developers' as per spatiotemporal conditions affecting sago using agrarian societies taken from prehistorically assessed conditions to the contemporary prevailing situation shaped by the desire to link markets and people with the urban area from a noble development point of view. One philosophical way of reviewing the progress hitherto is to view development, as a multi-dimensional process as secluding and distancing itself from the populace of sago using agrarian societies, partly by design, owing to natural limits imposed by the topography, partly by inaction to recreate necessary conditions for moving a backward rural agrarian society forward.

This inaction or rather impasse to rural development in sago using agrarian societies was finally pierced through by the penetrative influences of a yen loan co-financed project, the Bereina-Malalaua Highway road, which ultimately laid bare and made visible the essential struggles of developing a plant genetic resource (PGR), the sago palm, of which the prescribed tasks entailed in negating the 'underutilization phenomena', of this resource, captures the aesthetics of a SMP. Therefore, the efforts and resources to be channelled to sago using agrarian societies for supporting the rural sago palm industry from an absolutely underutilized food crop industry to a more commercially oriented cash crop industry, as is showcased in Sarawak, East Malaysia and Riau in Indonesia, is then equated as a SMP scheme in essence.

The SMP has prescriptions for likely outcomes and means specified and its project goal is necessarily that of community asset building and its super goal is that of providing a sustainable, adaptable and more secure livelihood system in sago using agrarian societies in Malalaua area. Community asset building is a complementary goal of the SMP and both aspire to offset the 'underutilization phenomena' in sago using agrarian societies. The 'underutilization phenomena' of the sago palm in sago using agrarian societies can be conceptualised as morbid symptoms, whereby its roots are deeply embedded in the socio-cultural relationship between sago palm management, ownership and utilization schemes. In describing how societies adapt and change, for instance, it could be argued that:

cultures are often perceived as static, unchanging, unyielding, and inherently conservative ... and these persisting symptoms serve as barrier to development and modernisation; local people are characterised as a problem precisely because they will usually cling to their existing ways; and local cultures are hidebound by myths and irrational practices... (citing Stockin 1996).

If culture is a total way of life in a particularistic society, and societal norms and established mores serve as the game of life, then how could it be possible to condition the behaviour of a populace in sago using agrarian societies through sanctions or rewards, so as to participate in, say, the sago palm industry? Most certainly, some form of rewards or incentives may induce participation. For instance, to participate in sago farmers' functional literacy training programmes on sago palm harvesting and agronomic management methods, one must first be a member of a sago users group and this group must be socially mapped and its controlling rights must be recognised by law. Such a reward for participation would ensure purpose for participation, which is tailored towards dissemination and sharing of knowledge of better agricultural methods and practice for sago palm in sago using agrarian societies.

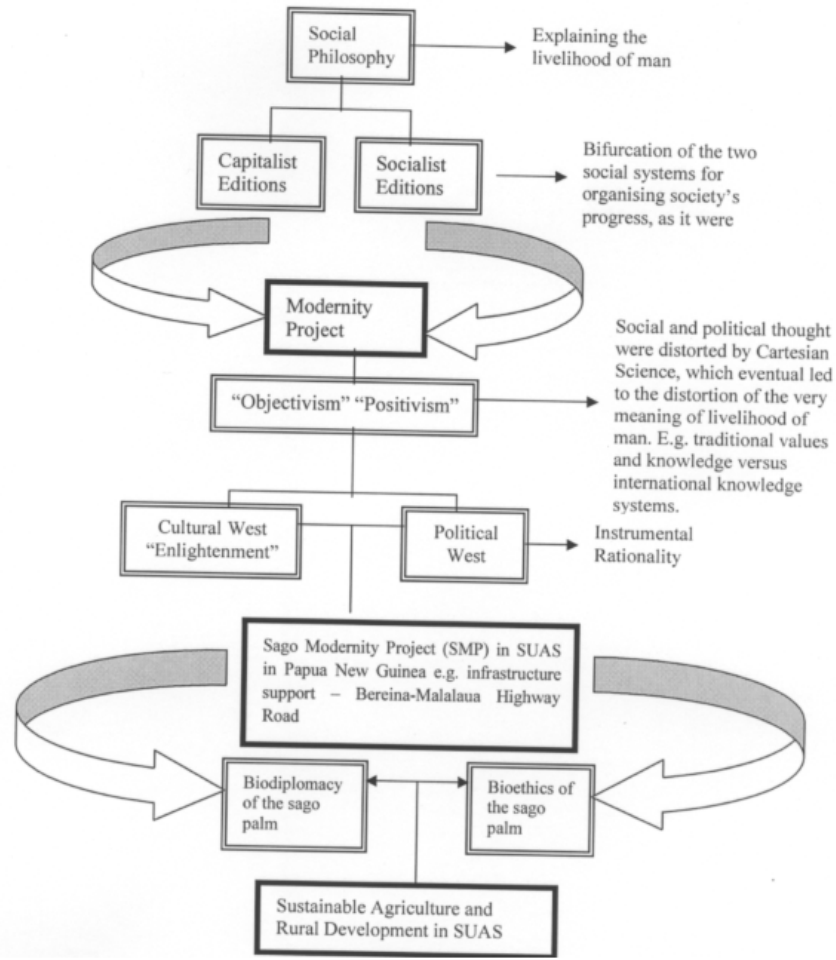
A systems thinking approach to knowledge acquisition and sharing with respect to indigenous knowledge, let alone western scientific knowledge on sago palm management and processing, so as to learn, adapt and act accordingly with new improved situations, offered by science that is based upon high technology solutions, is also part and parcel of the SMP in sago using agrarian societies. Such knowledge acquisition and dissemination for both western scientific knowledge and indigenous knowledge (IK), considering different societal conditions, is best described by Stockin 1996; quoting Häusler 1995, where the latter provides a useful distinction of both knowledge systems:

**Western scientific knowledge (*episteme*)**

Western scientific knowledge (*episteme*) is characterized as being: analytical, impersonal, universal, cerebral, logically deduced from self-evident principles and is communicated in writing.

### Indigenous knowledge (*techne*)

Indigenous knowledge (*techne*) is based upon experience (empiricism), personal, particular, intuitive, implicit, integral and orally communicated. The study explored the ways out of the underutilization phenomena of the sago palm in sago using agrarian societies by promoting sustainable agriculture and participatory rural development. The assumptions, partly supported the evidence in this study is best illustrated in Figure 3, which underscores the inherent socio-historical and cultural management of the sago palm in Malalaua area of PNG.



**Figure 3** A diagram depicting the ultimate goal of promoting sustainable agriculture and rural development in sago using agrarian societies

Therefore, if one has to explain the causal factors in a simple causal theory, of what causes the underutilization phenomena of the sago palm in PNG, specifically for the case of Malalaua, it would be appropriate to show the implicit assumption and explicit observational assessments linking it to its history of sago palm management in the area. To appreciate the social philosophy of people in sago using agrarian societies is partly to explain their livelihood, of which bifurcation of the two social systems: capitalism or modern day economy and socialist welfare considerations have been organizing agents of society at large. The Sago Modernity Project, which embraces the two social systems that transcended on different societies is an evolving one, of which for others it is quite rapid, for others quite slow, and many factors are sought to explicate the cultural embodiments that reflect different socio-cultural practices. The modernity project has been a universal unifying and standardizing agent of a shared world of complexities, of which attempts were made to explicate the 'social world' from the 'physical world', of which positivism or objectivism has had a profound influence in our thinking of the times.

In the final analysis, we shall point out that the Bereina-Malalaua road as a major infrastructure has both a *teleological* character highlighting its purpose of supporting participatory rural development and an *incremental* character, that change has been visibly promoted. Taking the incremental factor into commercializing the sago palm industry in PNG rests on the critical factors of dealing appropriately with the biodiplomacy and bioethics of the sago palm. Dealing with these holds the delicate balance of promoting sustainable agriculture and participatory rural development within sago using agrarian societies in PNG.

#### **Sago as a 'social forestry' – a root definition for future research**

In the language of systems thinking, a root definition is simply a hypothesis that is used to abstract from a complex reality in attempting to seek tentative ideas for solutions to a problem, which has become a key feature of strategic management as a sub-discipline of management studies (see Checkland 1999). In adopting a systems thinking approach to the biodiplomacy study on sago palm in PNG, we contend that sago forest very much equates with a 'social forestry' or 'community forestry' placed within the rubrics of agro forestry has gained currency in recent years, which is placing emphasis on participatory development approach at the heart of national and international development endeavours. Because of unchecked population growth and additional pressures placed on scarce productive resources in many developing countries, it has become abundantly clear that some form of intervention through resource control is critically essential in sustenance of livelihoods. Available arable land for growing food had diminished at astonishing levels, either because of high population growth pressures or through intensive crop rotation and harvesting practices, which has prompted an attractive option in reducing the fallow periods. Moreover, denudations of forests, too, have placed enormous dangers on depleting watershed areas. The interconnectedness of mutually reinforcing problems, are shared concerns, which have alerted authorities to ponder ways

to intervene through appropriate policy measures to arrest as well as mitigate the onslaught of these potentially catastrophic environmental concerns.

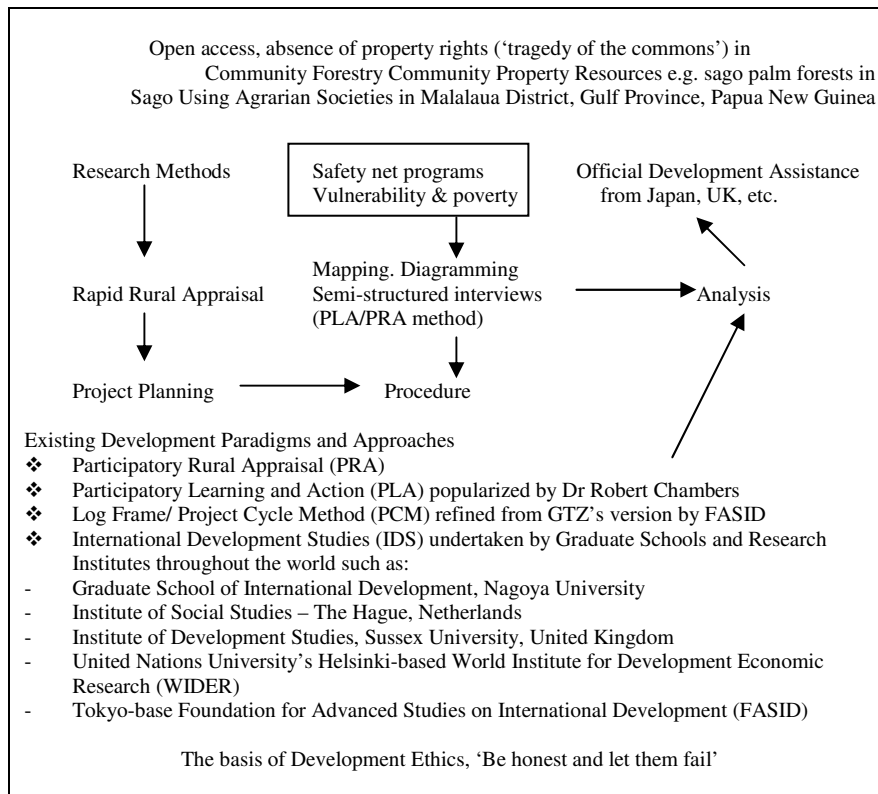
At the heart of the debate lies the 'tragedy of the commons' phenomenon, which poses the immediate problems outlined briefly above. Absence of controlling rights (ownership) problems have shaped much of the dilemmas, beyond considerable efforts at local, national, regional levels to adequately address these concerns. When nobody owns the forests, then the incentive to denude without paying attention to its adverse impact on the ecosystem and its environs become, at best trivial concerns, especially; for peasant farmers, who are more or less preoccupied with how to obtain their next meal and may have an apathetic proclivity towards what authorities from within their own countries or 'outsiders', say, volunteers from international non-governmental organisations or other development specialists from aid-dispensing donor countries such as Japan, Australia, New Zealand or even the United Kingdom would have in mind to tackle such problems.

Therefore, efforts to reduce denudation of forest will require an intervention from authorities within and 'outsiders' in a framework of participatory development approach whereby mutual considerations for conserving or harvesting at sustainable levels will be the key concern.

This approach has to have some form of safety net schemes to ensure its overall success on the ground, rather than in theory. Here safety nets – serve as basically income maintenance programs that protect a person or household from two adverse outcomes: a chronic incapacity to work and earn, and a decline in this capacity caused by imperfectly predictable life-cycle events (such as the sudden death of a breadwinner), sharp shortfalls in aggregate demand or expenditure shocks (through economic recession or transition), or very bad harvests. Safety net programs serve two important roles: redistribution (such as transfers to disadvantaged groups) and insurance (such as drought relief).

Having said that, it would be interesting to make plausible connections between how sago palm, in more or less aboriginal plantations, or put simply, sago forests (growing wild) state leap from a 'underutilized food crop' status to a 'favourable marketable cash crop' status; especially, for people in Malalaua District, Gulf Province of PNG. It should be clarified that the tag 'underutilized' refers to why there was no incentive at all to commercialize a commodity that is readily available, notwithstanding numerous calls by well-meaning researchers to that effect.

This does not augur well for enhancing rural development schemes or for the food industry, let alone stamping the tide on expensive starch imports, such as rice when there is abundance of starch stored in trunks of sago palms to be fully utilized domestically.



**Figure 4 Safety net procedure for illustration**

On the one hand, dissecting the aesthetics of the sago palm situation in Malalaua area is confronted with a dialectical quagmire, exposing it to contradictions such as while population growth and usage of sago palms are quite rapid, meanwhile concurrently there is also the condition that the sago forests exists in almost 'untouched' state, alluding to the possibility of no clear ownership in essence.

What would transpire if commercialization of sago palm, in itself, would be the catalyst for sago palm stock depletion, which goes back to the theory of the tragedy of the commons, which is driven by fears of scarcity where Malthusian tradition has some merit in the debate? At this juncture, one may ask whether it is really the 'resource gap' or the 'knowledge gap' precluding the development of the latent potential of the sago palm industry.

### **Two-pronged approach for economic and social inclusion policy Formulation**

Negation of the 'underutilization phenomena' in sago using agrarian societies in Malalaua area requires a two-pronged approach from relevant authorities

with respect to developing appropriate social and economic inclusion policy responses so as to forge cooperative links with interested foreign firms and local entrepreneurs in the sago industry. The question of how to implement this two-pronged approach becomes increasingly important for rural agrarian societal transformation process to take place at this juncture. To address this necessary transformation process would require addressing both the 'bioethics' and 'biodiplomacy'<sup>5</sup> of the sago palm, which necessarily prescribes the parameters, or the ontological nature for effectively promoting sago commercialization process on a more grand scale. Articulating the sago palm mode of production is a relative function of how best to combine bioethics and biodiplomacy issues.

Addressing the bioethics of the sago palm in sago using agrarian societies in Malalaua area prescribes the need for resolving sago palm tenure issues, which could be addressed through social mapping of ethnic groups, in conjunction with voluntary land registration, so as to militate against the social conflicts, let alone struggles arising from traditional use or commercial exploitation of a natural resource, the sago palm. It will be quite necessary for landowning groups to register their traditional land<sup>6</sup> under the Land (Group Incorporation) Act (1974), as important first step towards the underutilization negation process of the sago palm. This will strengthen the weak 'inter-linkages' between sago palm ownership and technology application, in that, the absence of a defined ownership structure outside the scope of the aforementioned piece of legislation, there is no commitment to improve land for commercial purposes, though another important piece of legislation, the Land (Tenure Conversion) Act (1963), provides the mechanisms for developing agricultural and rural pastoral land<sup>7</sup>.

Economic inclusion for participating in the sago commercialization process rests on the land issues meaning that resource exploitation cannot proceed, until and unless resource owners in sago using agrarian societies in Malalaua area collectively resolve these legal issues. Legally defined ownership structure in place, could not only effectively change the 'plant and forget' mentality and move it towards horticultural management of sago palm, but could also awaken societal consciousness to proactively ponder means to adopt better pith and starch extraction technologies. Change in management system of sago palm processing and utilization from that of traditional arbitrary exploitation from wild stands to horticultural management so as to comply with logic of the market for commercial purposes rests on recreating mutually a 'win-win situation' within the confines of existing pieces of legislation. This would facilitate coordinated control and management of sago palm, whereby resource owners and resource developers could be better off through constant dialogue for sustaining and improving the sago palm industry to a viably self-sustaining rural industry, thereby negating the myth of economic exclusion, and in its place, economic inclusion of benefit sharing in sago using agrarian societies .



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