

## **Social Metabolism: The Kinetics of Entropy and Osmosis in Transforming Farming System**

**S.K. Acharya and N.K. Sharma**

*Department of Agricultural Extension, Bidhan Chandra Krishi Viswavidyalaya,  
Mohanpur, Nadia, West Bengal-741 252, India.*

### **Abstract**

The creation, growth and decay of any social system, retaining myriads of life forms, have basically been the concerns and exposition of energy. Social Metabolism envisage a natural connectivity amongst physical, biological and social systems and their underlying cybernetics. It is the flow of energy that drives the social systems generating information, applying information and transforming the present social process into a desired social outcome. Energy remains retained, shelved and configured within a cell and within a social capsule and also is subject to a ruptured release for unshing motivations and psychological capabilities. The present paper examines the collision and collusion between imposed technologies vis-a-vis extraneous knowledge vs. intrinsic vis-a-vis in situ knowledge. The rejection of innovation, prescribed by experts, has got a reverse osmosis impact in the entire technology socialization process. Generally the rejected and discontinued technology has been branded as laggard but the logic behind rejections not esteemed properly. The farming system performance cannot be conceived as an indoor, interactive drama, rather it is a splendid disposition of social metabolism, where in the flow in and flow out of energy can be audited and monitored for sustainable farming performance of both the farmer and the manager or the both encapsulated in a single entity. The factors like cropping intensity, size of holding, education, motivation, access to information, the socialization level of technology have been found generating reticulate impact on the social osmosis through the intervening characters like, adoption, rejection and discontinuance, on and over a spectrum of prescribed innovation.

**Keywords:** Social Osmosis, Social Metabolism, Entropy, Discontinuance, Laggard, Motivation, Access to Information.

## 1. Introduction

### 1.1 Food security and Knowledge

The building block of civilization is knowledge. Knowledge is pursuits and acquisition, concepts and application and so on. The history of ten thousand years of agrarian civilization is basically the history of humane innovation to tame the nature and shape the life, the way we desire. From hunting economy to present day

The post world war II shift in the development world to intensive farming systems with modern chemical and energy technology led to major increases in plant and animal production. These systems maximised production through specialization, increased sale of production units minimized labour requirements and maximised use of technological inputs. They allowed western nation to fulfil more adequately than any societies have before what Ponting (1991) calls “the most important task in all human history”- to find a way of interacting from the ecosystem through resources to maintain life. Goldschmidt’s (1998) work claims that the singular goal of our agricultural system was to “gain wealth, without the least concern for the welfare of those whose lives were being destroyed.” There was little thought about the effects of the money driven system on the environment. The social community, the spiritual satisfaction of serving a larger public purpose and the communities themselves and the business that they need and support were sacrificed to the bottom line (Goldschmidt, 1998). Convenience, ready availability, and low cost are not the only thing that matter. There are other things that are important such as presence of local business, friendliness, services, essentialities of business to any community’s survival and local employment opportunities and if larger scale farming eliminates or harms these things. The losses (Goldschmidt, 1998) speaks of are the social cost of agriculture technological changes.

A farming system is defined as a population of individual farm systems that have broadly similar resource bases, enterprise pattern, household livelihood and constraints and for which similar development strategies and intervention can be applied. Farming system in India has been characterised with high level of adoption, rejection and discontinuance. Agriculture in India demands transfer of technology, external supply of inputs as well as knowledge, where rural people have become mere recipient of input and technology. In India in general and West Bengal in particular through the continuous imposing of knowledge and motivating the rural people a gap has been found between motivation unleashed and accomplished made and there is a gradual dissolving of the most advance societies due to intrinsic disorder that may be referred to as social entropy. This is responsible for institutional conflict, organizational disorder or social entropy. Social entropy is a macro-sociological system theory. It is a measure of the natural decay within a social system. It can be defined as the decomposition of social structure or of the disappearance of social distinctions. Social entropy is the amount of motivation unavailable for performing in system. Mitchel (2009) studied on a village (Jacobs) in 1998 through creative destruction developed and predicted the fate of communities that became the base of their development on the co-modification of rural heritage. You, L *et al.* (2006) while reporting agricultural

production statistics on geopolitical and on national basis concludes that there is a need to know the status of production or productivity within specific sub regions, watersheds or agro-ecological zones. His study depicts entropy based approach to make spatially disaggregated assessments of distribution of crop production. Jen, K. A *et al.* (1999) in his multi-method field study of 92 work groups explored the three types of workgroups diversity (Social category diversity, Value diversity and informational diversity) and two moderators (task type and task interdependence) where these workgroups not only became central to organization but also presented their own intrinsic problem of coordination, motivation and conflict management.

Therefore, keeping core periphery contradiction in the development process that has caused structured chaos and dissonance in view, the present research has been conducted for the prediction of the social entropy amongst the farmers from a score of socio-personal, socio-psychological and communication variation. Farming systems deals with production system and production function, it is load based, crop based, and natural resource base and thus crop productivity is a function of physical, biological and social subsistence. The stage of equilibrium, physical, biological and social is the prime concern of any system, it is more important for extension system because it aims at adding disequilibrium to a depletive function e.g. (Poverty) in order to invite neo-equilibrium (sustainable livelihood). People are more concerned about the conservation of energy that to in terms of fuel energy or electricity, power etc but seldom we speak out conservation of social energy and recycling of motivation. Methodology for conservation of social energy: Training; education; meditation; simulation; psychotherapy; stimulation.

## **2. Social Metabolism and Social Entropy**

Every day an immense mass of the materials and the energy of nature are, through work activity, appropriated by the social body, only to be adapted to its needs, through production activity and distributed to the various parts through circulation, transformed into the social fabric by means of absorption (as for food) by both institutions and individuals, and returned into the lap of nature through the consumption of goods and bodily forces. Schaffle clearly outlined the mechanism of that social metabolism by means of which the energy and the matter existing in nature enables the social body to maintain itself. The economic and physiological exchange of material does not entail the destruction of the material and energy but, rather, it entails their re-organization into sources of energy and into institutions which make their social use possible. Basically Schaffle applied thermodynamic principles to social exchange. According to this principle energy and matter are not destroyed but are only transformed, disorganised and then reorganised for other uses. An efficient mechanism of social metabolism can neither allow any energy to be lost nor permitting increasing entropy, would the result be crisis within the social organism itself. (Schaffle, A. 1874).

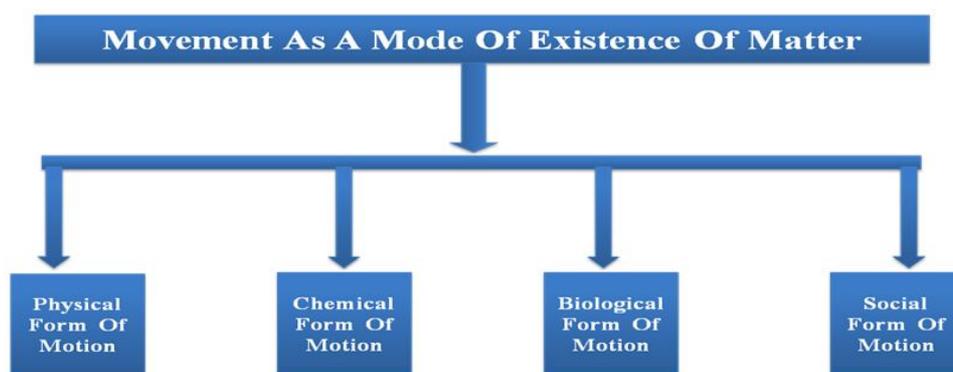
Paul Lilienfeld's opinion, human society, like natural organisms, is a real entity. It is nothing but a continuation of nature, a higher manifestation of the same forces that underlie all natural phenomena. It like all living organisms, is characterised by the

differentiation of parts and the integration of wholes, the development, perfection, multiplication, specialization and refinement of structures, the storing of energy. Biological and social organisms are similar in this, rather, they are homologous. Society is only the highest form of an organism and just like an organism; it too is a living unity, absorbing the ingredients of its environment and with a metabolic process. Its individuals are as dependent on the whole society as any cell is within an organism and, like a cell; society too has its nervous system and its reflexes.

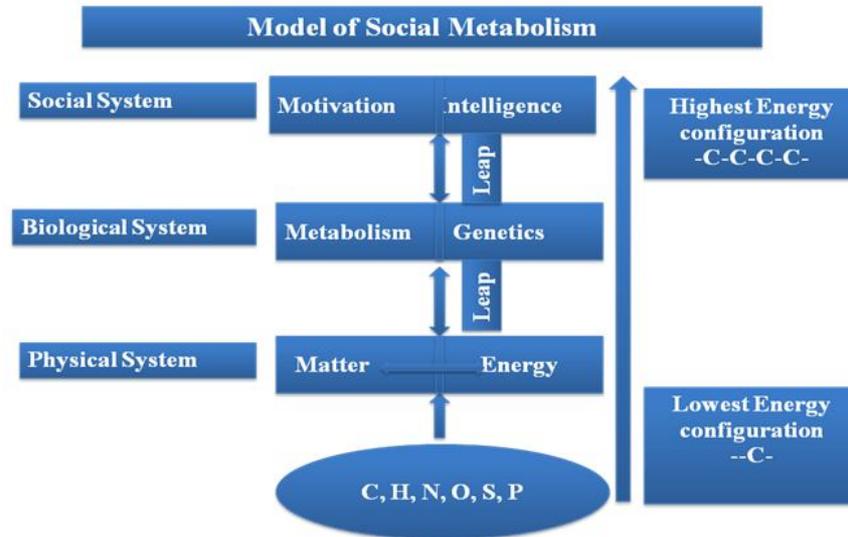
Analogical thought, and early reflections on the relation between living organisms (Biological and Social) and the environment laid the foundations for the discovery of the phenomenon termed "Social Metabolism". Fisher-Kowalsky and Haberle 1994, described Social metabolism as "the particular form in which societies establish and maintain their input from and output to nature; the mode in which they organize the exchange of matter and energy with their natural environment". It was assumed that this concept was the product of sociological organicism and when sociology became more rationalist and individualist, it lost this perspective which linked society with its environment. The very process of social metabolism became clear when Spencer said that the lowest social stratum is the one through which such matter are taken up and delivered to agents who pass them into the general current of commodities (Spencer, 1876).

The lack of sustainability of the industrial approach to agriculture is not a matter of personal opinion. It is a direct consequence of the most fundamental laws of physics, the laws of thermodynamics. The sustainability of agriculture, like the sustainability of any other type of development, ultimately depends upon the use of energy, because anything that is useful in sustaining life ultimately relies on energy. All useful material things – food, clothes, houses, automobiles – require energy to make and energy to use. And all human energy – working, managing, thinking – comes from the energy in things people eat, wear, or use. Physical scientists lump all such useful activities together and call them "work." All work requires energy. And most important, each time energy is used to perform work, some of the *usefulness* of the energy is lost. In performing work, energy is always changed from more-concentrated to less-concentrated forms. In fact, this natural tendency gives energy its ability to perform work. Material things, or matter, are simply highly concentrated forms of energy. When matter is converted into energy, as in eating food or burning gasoline, or when energy is used to do any kind of work, energy invariably changes from more to less concentrated forms. However, the total energy contained in matter and energy always remains unchanged. This is the first law of thermodynamics, the law of energy conservation, as in Einstein's famous  $E=MC^2$ . At first, it might seem that energy could simply be recycled and reused forever. If so, sustainability would be inevitable. However, once energy is used to perform work, before it can be used again, it must be reconcentrated and restored, which inevitably requires energy. The energy used to reconcentrate and restore energy, is simply no longer available to do anything else. It has lost its usefulness; meaning it has lost its ability to perform work. This is the law of entropy, the second law of thermodynamics; the tendency of all closed systems to tend

toward the ultimate degradation of matter and energy; a state of inert uniformity of component elements; an absence of structure, pattern, organization, or differentiation (Ikerd, *Sustainable Capitalism*, 2005.). Industrial approaches to economic development, including industrial agriculture, give no consideration of the ultimate necessity of using solar energy, the only truly renewable source of energy to offset the usefulness of energy lost to entropy. The pursuit of economic efficiency, which drives the process of industrialization, values only short run, individual self-interests. This narrow focus accounts for the advantage of industrialization in economic efficiency, but also accelerates the natural tendency of all closed systems toward dissipation and depletion of energy – toward entropy. Economic efficiency provides no incentive for “bottom-line” farmers invest in renewal or regeneration of resources for the benefit of future generations. Industrial agriculture inevitably tends toward *physical entropy*. The law of entropy applies not only to physical energy but also to social energy. All human energy is a product of social energy or social relationships. Humans cannot be born, reach maturity, and become useful without the help of other people. People must be educated, trained, civilized, and socialized before they can become productive members of complex societies. All organizations – including business organizations, governments, and economies – depend on the ability of people to work together for a common purpose, which in turn depend upon the sociability and civility of human societies. Human resources are the products of healthy personal relationships within families, friendships, communities, and societies. A sustainable agriculture must be fundamentally different from the mechanistic paradigm of industrialization. Sustainable agriculture must be based on the paradigm of living systems. Living things are self-making, self-renewing, reproductive, and regenerative (Ikerd, *Sustainable Capitalism*, Chapter 5).

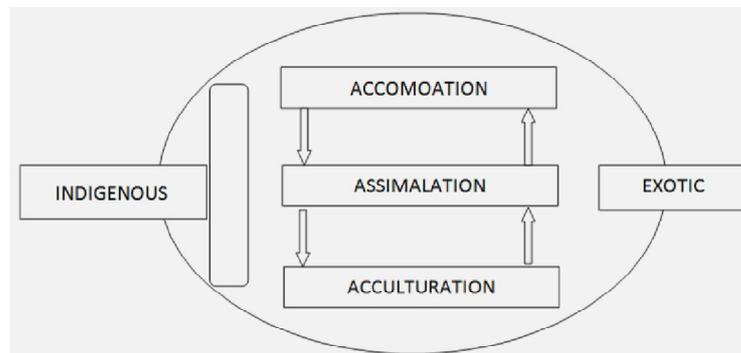


At certain stage of development, chemical process lead to formation of Protein body and on the basis of emergence of life i.e. to the biological form of motion of matter. It follows that some forms of motion of matter can turn into the other forms of motion of matter, which is reflected in the law of conservation and transformation of energy and matter. Each stage in the development of matter corresponds to a form of motion, differ qualitatively, and the highest forms of motion of matter cannot be reduced to the lowest.



### 2.1 Social Osmosis

Social osmosis is the indirect infusion of social, cultural knowledge. Effectively social control is diffused and by happenstance authentic experience is displaced by degrees of mediated separation before a subject acquires knowledge of a social phenomenon. (Raaj K. Sah, 1990).



Knowledge always undergoes a social osmosis process to exchange, imbibe and assimilate. Even sometimes the heteromorphic contents.

### 3. Methodology

73 respondents were selected randomly from 250 growers of village Ghoragaccha of Block Haringhata in Nadia district of West Bengal. Socio-personal variables like age (x1), Education (x2), Family education status (x3), Family size (x4), Cropping intensity (x5), Farm size (x6), Annual income in Rs/year/capita (x7), Socio-psychological variables like scientific orientation (x8), Independency (x9), Innovation proneness (x10), Risk orientation (x11), Economic motivation (x12), Orientation

towards competition (x13), Attitude towards discontinuance (x14), Attitude towards rejection (x15), Communication variables like Social participation (x16), Utilization of source of information (x17), and training received (x18) as predictors, whereas, among predicted or dependent variables, Noncompliance (Y1), Disagreement (y2), Conflict (Y3), Alienation (Y4) Social Entropy (Y5) were taken. Social entropy (y5) was obtained first by multiplying all the four predicted variables y1, y2, y3, y4 and then dividing the resultant product by 4.

Data were collected directly from the farmers with the help of structured schedule through personal interview methods. Collected data from the selected farmers were analysed with the help of several statistical tools like mean, standard deviation, coefficient of variation, correlation, regression and path analysis.

#### 4. Result and Discussions

**Table 1:** Coefficient of Correlation: Entropy (Y5) vs. 18 Independent Variables.

Sl. No.	Variables	Coefficient of Correlation
1	Age in years (x1)	-0.067
2	Education (x2)	0.033
3	Family Educaion status (x3)	0.115
4	Family Size (No. Of members) (x4)	-0.027
5	Cropping Intensity (x5)	0.184
6	Farm size in bigha (x6)	0.074
7	Annual Income (x7)	0.025
8	Scientific orientation (x8)	-0.121
9	Independency (x9)	-0.129
10	Innovation Proneness (x10)	-0.124
11	Risk orientation (x11)	<b>-0.239*</b>
12	Economic motivation (x12)	0.007
13	Orientation towards Competition (x13)	0.085
14	Attitude towards discontinuance(x14)	0.146
14	Attitude towards Rejection (x15)	0.152
15	Social participation (x16)	-0.114
16	Utilization of Cosmopolite Sources of information (x17)	0.041
17	Training received in days in last 3 years (x18)	0.029
18	*significance of r at 5%=	0.230
19	**significance of r at 1%=	0.300

After computation of collected data from the selected respondent it was found in table1, that the risk orientation has both resilience and strength of mind set to accept

and to adapt to new and un-anticipated situation. The lesser the flexibility and resilience, the higher will be the conflict and non-compliance. A stressed mind is well vulnerable to changes and challenges. The farmers' mindsets have become the most interesting lab for all kinds of social chemistry where in various interactions and interrelationships have come up so far as a repository or complex psychological interaction. Risk orientation (x11) has got strength to extra orbital for both averting internal rifts and welcoming external opportunities. A person having lesser risk orientation is supposed to go more and more vulnerable in a climate of society whether forecasting on eventuality is itself a complex probability.

Stepwise regression and backward elimination techniques considering highest regression coefficient for social Entropy (Y5) as dependent variable and remaining 18 variables as predictors.

$$Y5 = 22.17 - 2.21 X11^{**}$$

$$R^2 = 0.06, R^2 (\text{adj}) = 0.04, Se (\text{estd.}) = 4.77$$

Where, Y5 is social entropy

X11 = Annual Income (Rs/year/Capita)

R= Régression Coefficient SE = Standard Error

Above finding shows that economic gain has both consolation and contradiction. Consolation generates because present problem has been resolved and contradiction simmers because whether to justify the glory over the inglorious one. The competition in agrarian society is increasing while hegemony starts ignoring the access to income by others. The sudden surplus income creates a stress in the serene and soft relationship, the binding force is family.

**Residual effect = 0.6902095**

**Table 2:** Path Analysis for Estimating Direct, Indirect and Spurious Effect.

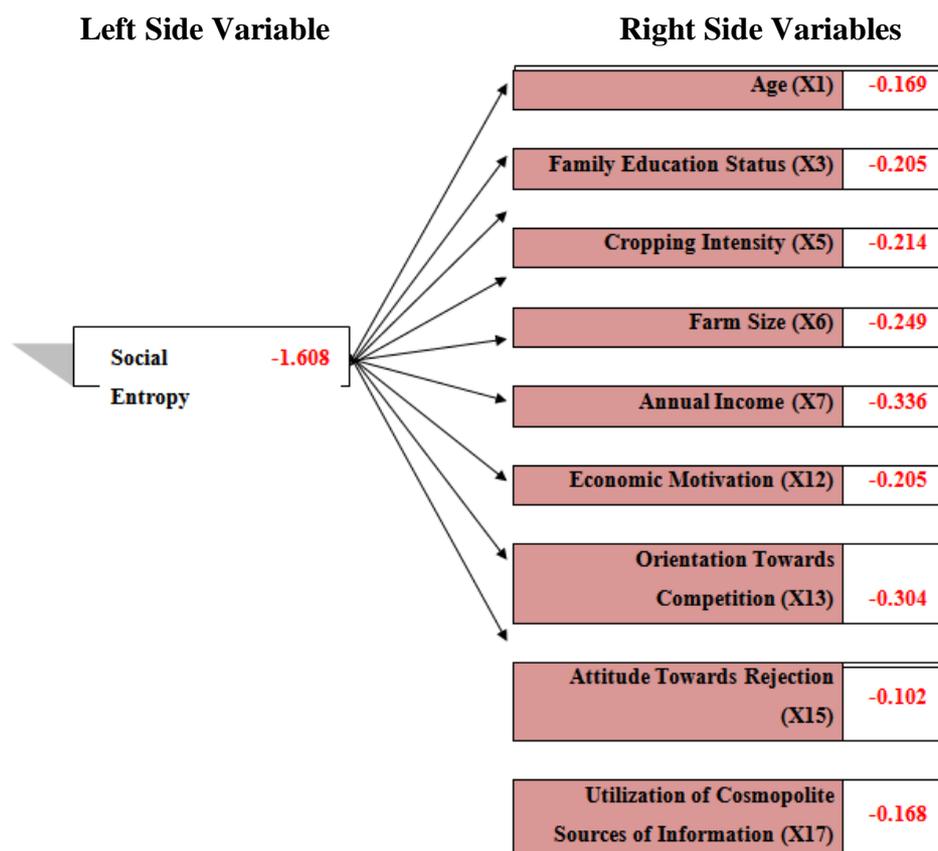
Entropy (Y5) vs. 18 exogenous Variables:							
Sl. No.	Variables	Direct effect	Indirect effect	Total effect (r)	Substantial Indirect effect		
					I	II	III
1	Age in years (x1)	-0.02799	-0.03901	-0.067	0.02751 (x2)	-0.02179 (x6)	0.01990 (x10)
2	Education (x2)	-0.07394	0.10694	0.033	0.09631 (x3)	-0.03617(x10)	0.02750 (x6)
3	Family Education status (x3)	0.11994	-0.00494	0.115	-0.05937 (x2)	0.03206 (x7)	-0.02759 (x9)
4	Family Size (No. of members) (x4)	-0.13765	0.11065	-0.027	0.06436 (x6)	-0.02452 (x8)	-0.1624 (x9)
5	Cropping Intensity (x5)	0.08339	0.10061	0.184	-0.04264(x10)	0.02735(x3)	0.02603(x9)

6	Farm size in bigha (x6)	0.14627	-0.07227	0.074	-0.06057 (x4)	-0.04341 (x8)	0.02959 (x12)
7	Annual Income (x7)	0.11055	-0.08555	0.025	-0.05007 (x10)	0.04502(x12)	0.034789x3)
8	Scientific orientation (x8)	-0.10436	-0.01664	-0.121	0.06085 (x6)	0.05043 (x12)	-0.03761 (x11)
9	Independency (x9)	-0.19570	0.0667	-0.129	0.03583 (x17)	0.01931 (x6)	0.01691 (x3)
10	Innovation Proneness (x10)	-0.18714	0.03394	-0.124	0.03505 (x7)	0.02804 (x12)	0.02435 (x3)
11	Risk orientation (x11)	0.12864	-0.05186	-0.239*	0.03062 (x12)	-0.02356 (x15)	0.02311(x6)
12	Economic motivation (x12)	0.13456	-0.12164	0.007	-0.04454 (x11)	-0.04091 (x8)	-0.03869(x7)
13	Orientation towards Competition (x13)	0.11082	-0.04956	0.085	-0.01445(x4)	0.01404(x11)	-0.01295(x10)
14	Attitude towards discontinuance (x14)	0.10025	0.03518	0.146	0.02776(x8)	0.02200(x16)	-0.01957 (x9)
15	Attitude towards Rejection (x15)	-0.10000	0.05175	0.152	0.04398(x11)	-0.03975(x12)	-0.02565 (x7)
16	Social participation (x16)	0.10356	-0.014	-0.114	-0.02717(x10)	-0.02438(x14)	0.02300(x7)
17	Utilization of Cosmopolite Sources of information (x17)	0.00234	-0.06256	0.041	-0.06771(x9)	0.02384(x6)	0.02100(x16)
18	Training received in days in last 34 years (x18)	0.00234	0.02666	0.029	0.02807(x3)	0.02326(x4)	-0.02056(x2)

The table 2 shows that x9 has got a substantive impact on Social entropy. Table also depicts that economic motivation is skewed version of emotion pinpointed for economic gain, may be through competition, denial to others rights, or through a clandestine performance which again can be clever or a deceiver one. The elements of consumerism, an unhealthy competition, the other side of monolithic development has done more harms than the goods delivered by it. Innovation proneness has got profuse impact on generating competition to supersede the laggards and ultimately make them subjugated in a system hierarchy. If not properly refined every ego has got deleterious impact over the peers or the defeated ones amongst the peers. Farm size with high

economic motivation has made one victorious and the others deleted ones. This has got, certainly, a catalyzing role in making social entropy a more complex hecatomb to make life confined and claustrophobic: this is what we call Social Entropy.

**Table 3:** Canonical Variates of Root 4 {Social Entropy (Y5) vs. 10 Independent Variables).



The table 3 shows the canonical correlation analysis of social entropy which is placed at the left side of the variables and selected independent variables on the right side of the table. It is clear from the table that family education, Economic motivation, Orientation towards competition and Attitude towards rejection has been precisely chosen for conceptualising Social Entropy. Farmers in different parts of India and here in west Bengal, are engaged in or confronted with each other to show the power or defined their rights. The ambition for earning more may deny the rights of others or a sense of flamboyant intrusion may make others feel suppressed or denied. The attitude towards rejection may not go as a placid social action, but may generate harsh social reaction, too. These all are becoming more complex by the oriented towards competition.

Competition never goes linear or insulated, rather it begets splash of micro-confrontations of aims and interests, a vision and vistas of goes and gateways. That's why it is really scintillating to see that the interaction between right side and left side variables have assumed the character of a 'chilate' function wherein, the predicted character 'social conflict has directed and precisely selected some of the right side factors or ultimately being defined as congenital and interactive disposition of social conflict.

## 5. Summary and Conclusion

The present study was a concept paper on social entropy, an analogy of principle of Second law of thermodynamics. According to second law of thermodynamics transformation from matter to energy is an irreversible phenomenon therefore it needs to be kept at a manageable level. The gradual modernization in agriculture has produced the jerk, chaos or disorder following the attitudes of the farmers towards discontinuance of the stale technologies and their increasing attitude towards rejection. This has an explicit exhibition of non-compliant behaviour, attitude towards disagreement, conflict and ultimately gets alienated. This has gradually added to, that can be refer to, social entropy.

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